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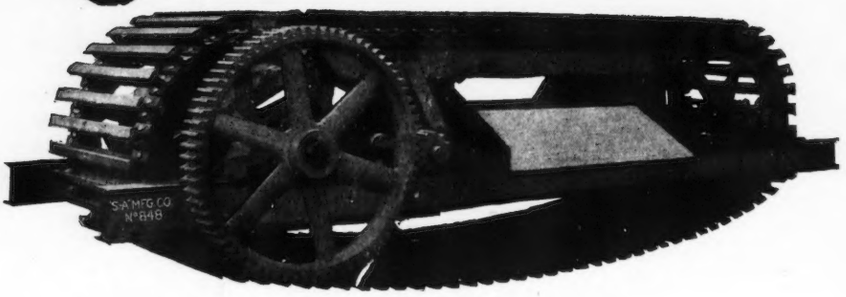

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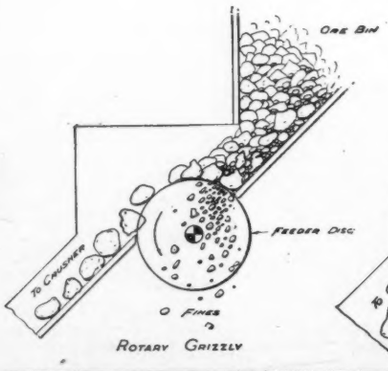

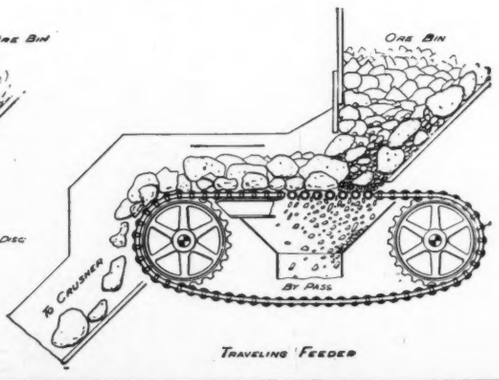

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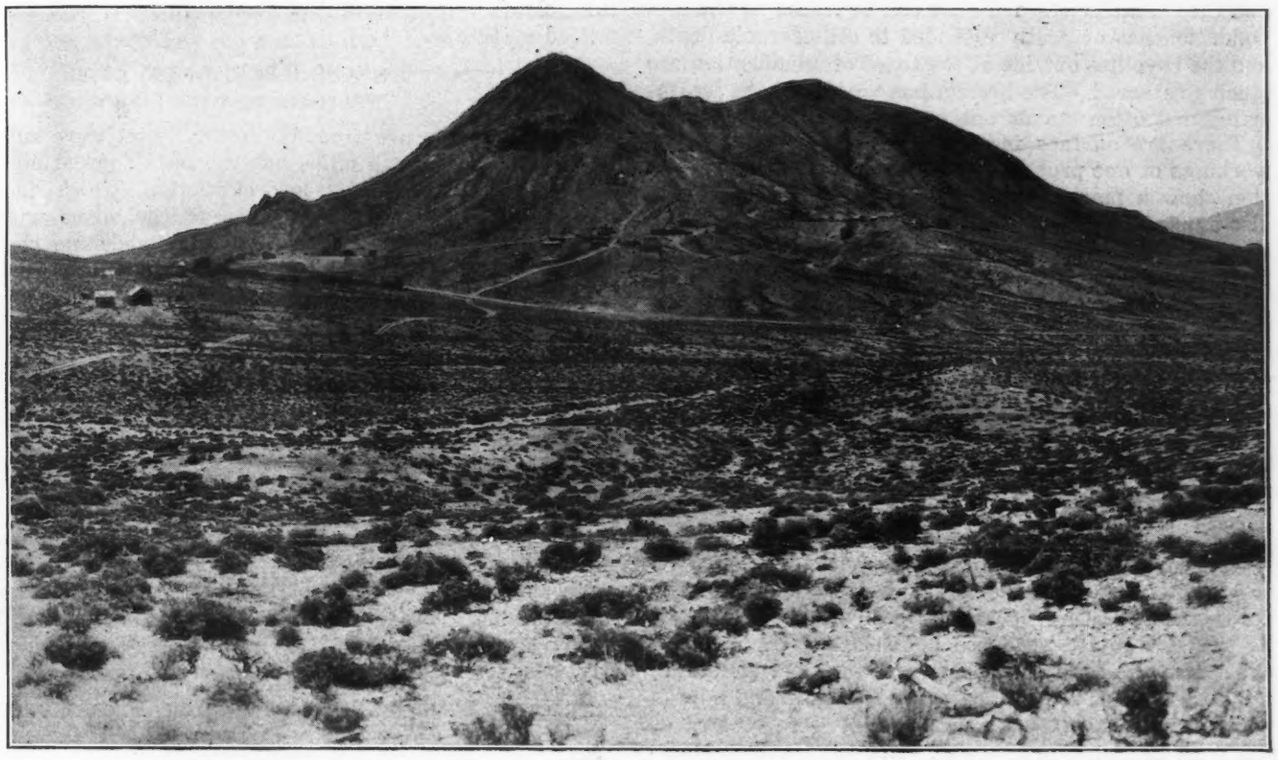
Engineering and Mining Journal

May 17, 1919

Volume 107 *Number* 20



GOLD MOUNTAIN, IN THE TONOPAH DIVIDE DISTRICT OF NEVADA

The Divide District

BY JAY A. CARPENTER*

Attention was first attracted to the Divide district of Nevada by the presence of free gold, but the lack of high-grade gold ore prevented extensive exploration at the time of discovery. Recent developments have disclosed the presence of silver ore, which shows increasing richness with depth. At present the district is undergoing experiences similar to those met by earlier Nevada mining-camp booms. There is, of course, the speculative element which has characterized every rapid development in the mining industry, but sufficient stable exploration is being done to promote the future activity of the camp.

THE Divide district, near Tonopah, Nev., has suddenly sprung into prominence owing to the fact that within a few months one large mine has been developed from a prospect, and the investing public is being told that further development will bring forth many more productive properties. The district is advantageously situated and is reached by the main highway connecting Tonopah and Goldfield, being only six miles south of Tonopah, yet lying within Esmeralda County, of which Goldfield is the county seat. Before Goldfield was discovered the Divide district had its boom and was located for miles by Tonopah prospectors. Because of the persistent showing of free gold over a large area, it was known as the Gold Mountain district. Considerable surface work was done, but high-grade ore was not disclosed, and the discovery of Goldfield lured away both prospector and capital.

Geologically speaking, the district is one of nearly horizontal flows of rhyolites, breccia, and basalt. Erosion has left many small mountains, most of which are overlain by a later rhyolite flow, though a few are capped with basalt. There is little to indicate that any of these mountains are rhyolitic necks. The tufa, or lake-bed formation, frequently appears. The most prevalent breccia is a light colored, rhyolite ground-mass variety containing small, sharp fragments of other rhyolites, tufa, and siliceous pebbles. Another breccia is vitreous, and is filled with large andesitic fragments.

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Certain slopes have the appearance of weathered andesite, and granite outcrops to the west of the district. Across these formations numerous wide zones of fissuring and silicification, the so-called dikes of the district, can be traced for long distances. This fissuring usually has a persistent northwest strike, and both the rhyolites and the breccia are thus fissured and silicified. These zones show heavy oxidation of the original iron content, and the characteristic red color can be traced by the eye. Oxidation has evidently extended to considerable depth, and the rhyolites outside of the zones of silicification are much weathered. The breccia has withstood the weathering, and often stands out in bare, rounded hills.

There are surface indications of faulting, and the workings of one property in the tufa or lake-bed formation show a marked step faulting. The term fault is also applied to the lines of fissuring where the fissuring has been intense enough to shatter the rhyolite into thin plates and there has not been the usual cementing silicification. These fissures are practically vertical, and displacement is, therefore, not easy to detect.

The gold makes its appearance as free mineral in the fissuring in the silicified rhyolite. The body of silver ore that is now attracting attention to this district occurs along the same characteristic fissures, but in the breccia formation, and shows little silicification, but marked kaolinization.

Operations in District Slight Following Boom

Following the decline of the district in 1903, only two properties continued to be worked spasmodically for the next 15 years. One of these, a silver mine known as the Hasbrouck, produced a dense quartz, almost a chalcedony, and the other, known as the Gold Mountain, mined a silicified rhyolite carrying free gold and a large percentage of iron oxides. Both ores were treated at the West End mill, in Tonopah, after 1913, and the Hasbrouck is about to resume shipments. In addition to these two properties, several prospectors held their claims with remarkable persistency, and finally two of them took a lease on the Gold Mountain property.

Preliminary Work at Tonopah Divide Successful

The favorable showing made by the two men on this fissure vein in the rhyolite near the mountain top encouraged the principal owner, Cal Brougher, to incorporate the Tonopah Divide Mining Co., for the purpose of sinking a shaft on the hillside below and crosscutting to the vein. Although Mr. Brougher has been identified with the Belmont, Midway, and other mines of Tonopah since the discovery of the camp, the stock went begging, and he financed the undertaking practically through his own resources. The shaft was sunk just below a prominent northwest outcrop of rhyolite breccia. At the 165-ft. level a crosscut, driven toward the gold vein, at a short distance cut a well-defined wall in the breccia, with a change in hardness and color. Assays were made of this material, and the silver content, as shown by the returns, was such that it was deemed advisable to sample each round, and the results soon confirmed the fact that a remarkable discovery had been made.

The find occurred in war times, Tonopah was accustomed to large bodies of silver ore, and the new discovery was considered a freak because it was not found in a regular quartz vein in trachyte, and for the further reason that mineralization occurred in "mud seams" in the worthless breccia. However, George Wingfield, of Goldfield Consolidated fame, who had sold out his interest in the property two years before, on geological advice, did not hesitate to plunge in for a half interest with Mr. Brougher. At 265 ft. the breccia was again crosscut, and subsequent drifting cut a larger and higher-grade orebody than that on the 165-ft. level. On the surface an old cut in the breccia, unnoticed for years, was sampled, and assayed several ounces of silver to the ton. The original prospector had relied on the gold pan instead of the fusion furnace, and had missed a fortune.

Treatment Tests on Ore From 165 Level Unsatisfactory

Samples of the ore from the 165-ft. level were submitted to the Tonopah mills, but the tests showed high cyanide consumption and low extraction, which fact was attributed to the combination of the silver with oxidized molybdenum minerals. The molybdenum content was sufficiently large to warrant considerable work on a process to save it as well as the silver.

Development on the 365-ft. level disclosed a larger and richer orebody than that on the 265-ft. level. The drift to the southeast from the shaft crosscut disclosed mill ore for 400 ft., with the face still in ore, and crosscuts at 50-ft. intervals showed a width of from 10 ft. to 60 ft. of ore. As on the levels above, the ore was found to follow a series of vertical northwest fissures or faults, and at certain points both well-defined hanging and foot walls are found, but they are not continuous. A set of fissures cutting across the others at rather an acute angle is of considerable importance, for the ore at the contact shows enrichment and grows impoverished when distant from them. The richest ore is a blue-black clay, heavy with fine silver minerals.

Extraction Process Simplified With Decrease in Molybdenum Content

Silver sulphides and native silver, finely divided, appear with the silver chloride on the 365-ft. level. The ore is soft, and the silver minerals are finely divided, so that the beautiful specimens that characterized the Tonopah ores are lacking. On this level the molybdenum practically disappears, and the ore gives excellent results to straight cyanide treatment. It is much easier to crush and grind than Tonopah ore, and extracts more rapidly, but requires a much greater settling and filtering area.

The improvement with depth of each succeeding level attracted capital to the adjoining properties along the strike of the breccia outcrop at the Divide shaft. The Gold Zone, the Brougher Divide, the Divide Extension, the Tonopah Dividend, and the Divide Consolidated were amply financed. The breccia on the surface at the Divide mine contains little of value, and the ore from the levels below is oxidized and carries mostly horn silver. Consequently, the idea is prevalent that the surface has been leached and that depth by shaft sinking must be obtained before the formation is prospected.

Work on the 465-ft. level of the Divide mine has been in progress only a short time, but the remarkable showing on this and on the 365-ft. level, considering the development work done, has caused great excitement in the Divide district. The assay value of the ore on the 465-ft. level in the hanging-wall drift to the southeast, as given to the public and to the newspapers, has greatly exceeded that reported as coming from the 365-ft. level. The first 110-ft. is said to have averaged $60 a ton, and after that extremely high assays have been reported

up to 2604 oz. of silver per ton for the sample from one round. This drift has been driven over 250 ft., but crosscutting has not been done. Development work is hindered by the small installation now used, but larger equipment is being installed and the shaft is ready for the cutting of the 565-ft. station.

The feature of the development work to date is the fact that such a large proportion of it has consisted of operation in actual ore. The main mineral values to be found are silver, but the gold content is not negligible, as the ratio of silver to gold is about 250 to 1 by weight. Probably several million dollars in silver will be produced from the area opened up by the present development work, and the limits of the mineralized fissure zone, either in extent or depth, are as yet unknown.

Future of District Dependent on Development

The Brougher, the Divide Extension, and the Gold Zone on their lower levels have cut fair ore in development work in the breccia. Both extravagant and modest claims are made as to the quantity and grade of ore found, but the fact has been established that with development work these properties have an opportunity to become producers. Tonopah had but one property at which the ore-bearing trachyte formation outcropped on the surface, and only the distinctly quartz veins in the formation carried silver. The surface on the now famous Belmont mine is covered by a barren-looking white rhyolite; that of the Montana, West End, and Extension was covered with a badly weathered barren andesite. Yet companies were formed and money was raised in the hope that the trachyte underlaid the other formations and with the less probable expectation that it also contained rich quartz veins. In the Divide district today the breccia formation can be found for miles in nearly all directions, and with it are wide zones of faulting, fissuring, silicification, and oxidation, with the same approximate N. 45° W. strike of the Divide ore zone. What a chance for the locator, the promoter, and the mine maker!

Propitious Circumstances Favor Divide Boom

A boom was inevitable. Here was a new silver mine of great promise in a district that offered equal opportunities for miles around. It was close to one of the leading silver-producing camps in the United States that spelled wealth and stability. The war was over, and the "war babies" were off the market. Silver was the king of metals at more than $1 an ounce, with all the other metals under the cloud of reconstruction. The cool but plunging Wingfield, of Goldfield Consolidated fame and wealth, not content with the rich windfall of the Divide mine, played the wheel of fortune by investing in neighboring properties and buying and financing newly discovered prospects and mines.

With every train came men that have figured in every boom in Nevada for the last 20 years. The daily papers were forced to crowd out national news to give place to notices of prominent men purchasing valuable groups of claims, and incorporating the ——— Divide Mining Co. Ford cars vibrated up Main St. filled in the back with 4 x 4-ft. posts to be used as location corners. The Mizpah Hotel lobby was jammed with locators, curb dealers, engineers, promoters, and moneyed men. Allotments of a quarter million treasury stock were oversubscribed in a day by local money, and much of the stock was sold a week later for double the price paid, and it was listed on the exchange. This easy money is being reinvested in new promotions, and the process is as yet like the uninterrupted course of a growing snowball. The demand for claims resulted in the stiffening of prices until a favored group about a mile from the Divide mine brought $50,000, and groups of claims within three miles of the Divide, with only location notices up and corners staked, were held at $5000. The feverish excitement still exists, and will continue as long as the limits of the Divide orebody remain unknown and the adjoining properties continue to report improved showings. This boom phase of the new district's development will probably result in the establishment of fictitious values, and the loss of money to many investors, most of whom are more interested in the stock quotations than in the properties themselves.

The redeeming feature of the boom is that, of the 200 companies incorporated, nearly all are providing themselves with a treasury fund of $15,000 to $25,000 for development work. There has been no lavish expenditure for fine offices and autos, and there are no high-salaried officers. The purpose of every company seems to be to get to work. Operations are in charge of reliable and responsible men, and good shaft-sinking equipments are being installed. Competent shaftmen and hoistmen are already hard to obtain, and several hundred good workmen from the quiet copper camps will find employment here this summer.

Promotive Activities Conducive to Thorough Exploration

The large sums of money spent on development will thoroughly explore the possibilities of the district. Much unnecessary work will be done on ground that does not justify the expenditure or effort, but, at the same time, the work will determine to what extent the pronounced fissuring and silicification of the breccia and rhyolites have been accompanied by the mineralization of these same formations. Until the Divide mine found the ore, investors and engineers were skeptical of the small surface showings of the district, but today claim buyers do not demand even a surface showing, and many are more interested in knowing about their neighbors than concerning themselves as to whether or not the best formation and fissuring are present.

The high price paid for claims has put heart into prospectors, for they had been discouraged by the demand of the engineers for more ore in sight and for further development work. Claims at a strike sell like hot cakes, and for the first time in years the hills of Nevada will be covered with prospectors. This time they will travel in "flivvers" and with a grubstake large enough to pay for an assay on every promising piece of quartz, breccia, or rhyolite.

Conservative investors looking over the Divide district are already giving consideration to the many evidences of ore in the surrounding camps which dollar silver has made worth development work, and, with the advent of the Divide mine, a sharp revival in the search for and development of precious metal mines in Nevada has come.

Every Nevadan, loyal to the traditions of the Comstock, remembers with a thrill the stirring days of 1902 to 1906 that brought forward Rhyolite, Manhattan, Tonopah, and Goldfield, and devoutly hopes that the Divide is just the first of the new camps that will reëstablish Nevada's prestige as the premier producer of the precious metals.

The Mauss Centrifugal Separators

By E. M. WESTON

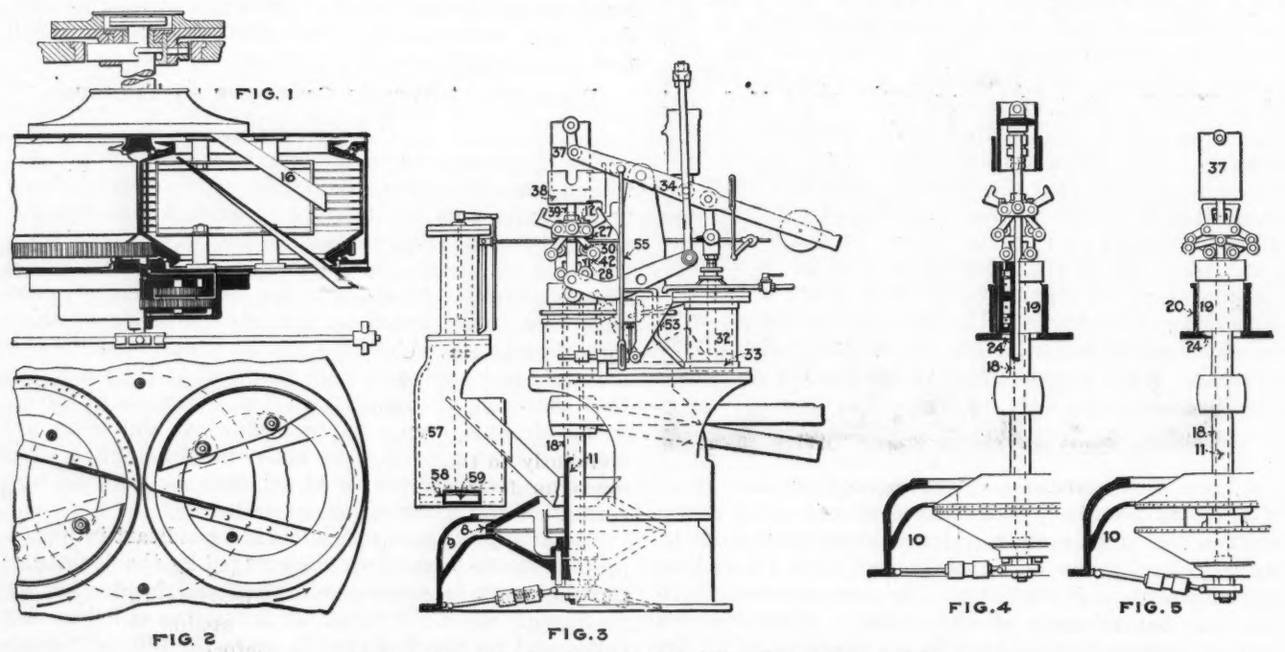
THE Mauss centrifugal separator is made in three main types. The type used for the separation of colloids from slimes, particularly tin-ore slimes, is shown in Figs. 1 and 2. It consists essentially of two bottomless buckets or vertical cylinders revolving rapidly in a frame around an upright spindle at a rate, for treatment of tin slimes, of 700 to 800 r.p.m. Each of the buckets has also an independent slow revolution on its own axis. The use of the Mauss machine in this connection has been to bring the intractable pulp into a condition where its mineral contents can be recovered on gravity chute *16* against the outer wall of the bucket at the point furthest from the central spindle.

The centrifugal force generated by the revolution of the whole frame packs the solid matter in the pulp against the wall of the bucket, the fluid flowing over the rim or lip, in the same way as in a cream separator, carrying the colloids with it. The slow revolution of the bucket on its own axis continually carries away the clean and dry solids packed against its wall, from the point of feed, so that a fresh face is constantly exposed to the feed flow. The packed solids are carried around in the bucket until they arrive at the inner wall or the point next the central spindle. Here the centrifugal force, which at first packed them against the wall, exercises a reversed effect, and they are discharged into a mixer to be fed to the concentrator.

Colloids are the chief source of loss and trouble in the concentration of tin slimes, as they entangle the mineral particles, and it is claimed that, by the use of this centrifugal, a recovery of 66 to 80% of the tin concentrate in slimes is rendered practicable. The experimental centrifugal when working at African tin mines gave a recovery of over 60% and treated about 25 tons per day. It was necessary to stop the machine until special steel could be procured from England. The separator will, it is hoped, soon be tried on the slimes of the Cornish tin mines.

The second separator, known as the "alkali" type, is of special interest at present, when attention is being directed to the more economical treatment of the caliche of the Chilian nitrate pampa. Two of these machines have been running for some time separating the soda from the slime of a soda lake near Pretoria which was worked by the South African Alakali Co., Ltd., and several more are on order. This type, shown in Figs. 3, 4, and 5, is essentially a centrifugal filter, differing from all previous types in that the charging of the pulp and the separate discharge of the fluids and solids take place in cycle and automatically during its uninterrupted revolution. This machine revolves at from 1500 to 2000 r.p.m. The cycle of operation is as follows:

The perforated separation drum, into which is fed the solution to be filtered, is in two parts, the division being on a horizontal plane; and when all the fluid is filtered away into an external launder, or hollow ring, the drum is lowered below the level of the launder, and then opened, while still revolving at the set number of revolutions per minute; whereupon the dry material which is left after the fluid has passed out is immediately thrown into a lower receptacle. The drum is then closed and lifted into the first position, and the solution to be filtered is again fed into it, and the process is repeated without stopping the machine. With this cycle of movement the machine can run for the whole 24 hours without stopping, being self-discharging and self-cleaning. The filtration may take a minute, according to the material to be filtered, but the throwing out of the dried material may make scarcely a second. The effect of this process is a continuous machine with intermittent action.

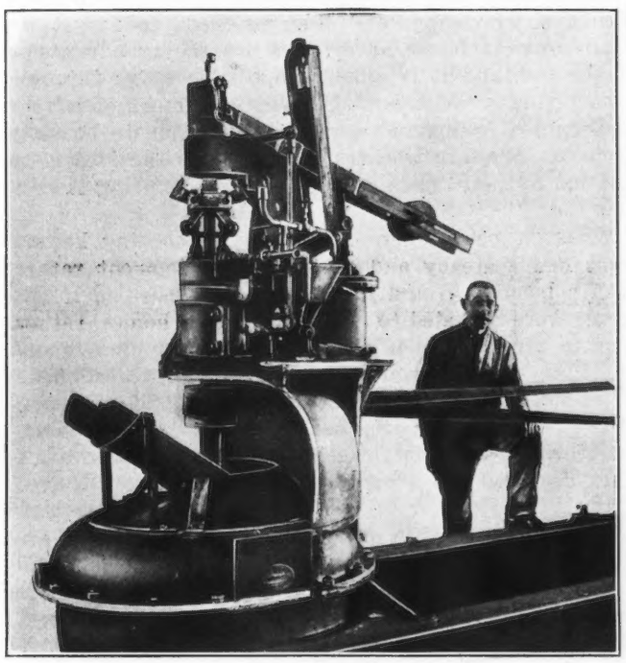


DETAILS OF THE MAUSS CENTRIFUGAL SEPARATOR

Figs. 1 and 2 represent the type used in the treatment of tin-ore slimes. Figs. 3 and 4 are suitable for alkali and similar work

The shape of the drum is roughly that of a double hollow cone, and it is formed by bringing together two hollow cones, the top one apex upward and the bottom one apex downward. This shape is evidently the best for securing a quick discharge of the dry material when the drum is opened. In action, this design is found to be almost perfect. The mode of securing the above-described operation is shown clearly in the accompanying drawings, Figs. 3, 4, and 5.

Fig. 3 shows the drum while running with its perforations level with the launder or horizontal hollow ring, discharging the fluid at its periphery. The section which is cut away in the drawing shows the method of fitting the screening inside the drum. The drum has an opening at the top, into which the pulp is fed by means of a funnel. Fig. 4 shows the drum lowered below the launder still closed and Fig. 5 depicts the



THE MAUSS SEPARATOR

drum when it is opened for the discharge of the dried material.

Gears are avoided in this design, and the lowering, opening, and lifting of the drum are secured by a time motion. Water is slowly poured into receptacle *53* (Fig. 3) and this tips over when full, opening a valve leading water at hydraulic pressure into cylinder *32*, lifting piston *33*. This piston actuates lever *34*, thus pushing down piston *37*, which works in a sleeve *38* and is fixed to rod *39*. This rod is rigidly fixed to the lower cone of the drum by means of the shaft *11* (movable within hollow shaft *18*), and is loosely joined to the top cone of the drum by the intermediate joint or toggle *12*, *27*, *30*, *42*, and *28*, which is fixed at the bottom with the hollow shaft *18*.

Whatever distance the piston and rod *37* and *39* are lowered or raised, the bottom cone of the drum is moved the same distance, but the movements of the top cone of the drum are varied in accord with a certain double action of the toggle. The position at the end of this movement is seen in Fig. 5, and is caused by arresting the downward movement of hollow shaft *18* by means of shoulder *24* of sleeve *20*, thus checking the downward movement of piston *19*, which is fixed to hollow shaft *18*. The movements of the drum are therefore as follows:

Stage 1—After the fluid is filtered out into the launder *9* through holes *8*, the whole drum, and the shaft *11* and hollow shaft *18* with the toggle in its closed position, are lowered by means of piston and rod *37* and *39* for a space of 2 in. Fig. 4 shows the position at the end of this movement.

Stage 2—Cylinder *19* is arrested by the shoulder *24*; the toggle opens (as in Fig. 5) and while the top cone of the drum remains stationary (except for its continued rotary motion), being a fixture with shaft *18* and piston *19*. The bottom cone of the drum continues its downward movement, being positively thrust downward by piston *37* through rod *39* and inside-shaft *11*. This downward movement of the bottom cone continues for 3 in., during which operation the dry separated material is discharged by the centrifugal action into the space *10* underneath the launder *9*.

Stage 3—On the application of the lever *34* giving an upward movement to piston *37* and rod *39*, the bottom cone of the drum is lifted 3 in. By the end of this upward movement the drum has become again closed and the toggle has reassumed the position shown in Figs. 3 and 4.

Stage 4—The upward movement of piston *37* and shaft *39* continues for a further 2 in., and in this further movement the cylinder *19* and hollow shaft *18* also move. Thus the whole drum is lifted into the position shown in Fig. 3, which completes the cycle.

The upward movement is caused by the reverse action of the hydraulic piston *33* in cylinder *32* (Fig. 3) the valve being operated in this case by the downward movement of rod *55*, which also simultaneously throws the time-motion cistern *53* back into its first position. Other details of the machine, such as the automatic feed *57* to *59*, incorporate methods which do not affect the general principle.

The machine works perfectly, and without vibration or friction. In separating alkali it produces 5 to 7 tons of crystal per day and lends itself most conveniently to the operations of fractional crystallization, such as from mixtures of solutions of common salt, soda, gypsum, and potassium salts.

The third type of machine is especially adapted, in the manufacture of sugar, to the rapid purification of the mill juice. In ordinary practice this juice has to pass through a number of appliances, clarifiers, eliminators, and filter presses, before it is clear enough for the vacuum evaporation. The processes are slow and expensive. Some are designed for the separation of heavy earthy and vegetable matters; some for the light waxes the specific gravity of which scarcely differs from that of the syrup. This separation carries out three processes in a single step.

Yukon Gold Co.

The annual statement and report of the Yukon Gold Co. shows that the adverse conditions affecting gold mining are reflected in the result of the company's operations for the year. The net operating income amounted to $45,898.70, which, when deducted from allowances for depletion and depreciation, amounting to $921,419.55, leaves a net deficit for the season of $875,520.85. Distributions amounting to $175,000 were made to stockholders in 1918.

Notes on the Housing Problem

BY CHARLES F. WILLIS*

IDEALISTS and "uplifters" are working overtime to promote housing projects, proclaiming through magazines, newspapers, and by word of mouth that improvement in the housing conditions of workmen is the panacea for all labor troubles, all dissatisfaction, all labor unrest, and the solution of many of the differences between capital and labor. Without doubt adequate and suitable housing of employees is a big step forward, and in many cases a necessity, but is it not possible that the impetuous United States, which never does things by halves, which goes all the way or not at all, will let the pendulum swing so far in housing betterment that it will have to come back again? Is it not possible that housing advancement may go too fast and have a reaction?

The advocates say there is no probability of this, and maintain that home ties mean contentment, attachment to locality, and a sense of security, and that the foundation for the building of a more beautiful, more efficient and more glorious America is labor. Further, it is contended that well-paid, contented labor and proper housing create a permanent home sense which will be a determining factor in the situation. Some point to the progress of England and France in their home building program, and to its results, but they fail to show the differences existing between the conditions in those countries and the industrial situation in the United States.

No one will question the appropriateness of good homes, of well-paid labor, of well-organized industrial communities, presided over by well-balanced, home-loving heads of families. It is an ideal toward which we must strive. There are few industries in this country that would not go to the limit to provide a community in which the people would take pride in living, where they would come and stay and bring up their families; in which the men would become home owners and home lovers, and have the same interest in the community that the industry had, though perhaps on a smaller scale.

Nor will anyone question the value to industry as a whole of having all workmen living under ideal health conditions, fully satisfied with their part in industry, their wages, working conditions, their part in the management, their share of the profits, and their protection. The Arcadian condition, labor and capital in complete harmony, is an objective toward which many are striving, but the question is: Can we reach this objective in one jump, or must we take several jumps?

Writers on housing betterment have long bemoaned the fact that the United States was reluctant to take up housing, housing standards and industrial villages, and that it was years behind European countries in this particular. But the war has changed all this. New industries created new towns—not the normal growth of towns, but cities overnight. As the cities could not care for the large industries made necessary by the war, the Government went into housing projects to the extent of millions of dollars, but as a matter of necessity rather than through a deliberate purpose to improve the condition of the workingman.

It was not done without thought and consideration, and the United States had European experience as an example. Government housing was considered in the proper relation to health and home conveniences and was not of the "fly-by-night" nature of some construction contracts. Industry did likewise. New and fine cities appeared, and, as one writer expressed it, housing betterment advanced a generation in one year.

The United States moves quickly. The impetus given to good housing proposals by the war promises to bowl all obstructions out of the way, and to dot the map of the United States with housing projects. America is faddish. She takes up a movement, goes through with it like a whirlwind, and then proceeds to forget it. Ready-to-wear house advertisers are taking advantage of the fad, and it is almost impossible to go through a magazine without coming across a number of advertisements of companies which aim to promote housing projects. Welfare workers have grasped the idea as a solution to their difficulties; reformers are using it as a new fad.

Would it not be better, however, if housing betterment had a steady and consistent development rather than a boom? Would it not be more desirable if the people were educated to appreciate better homes, rather than to thrust them into houses of a far higher standard than those to which they have been accustomed? After a boom, invariably there comes a reaction. A slump in the market and a step backward start the pendulum the other way, and might effectually put a halt to much work designed for a better, bigger, and busier United States.

In England and France the industrial workers are Englishmen and Frenchmen; in America the industrial workers are everything—Americans, and 57 or more varieties of foreigners, who represent, to a great extent, all stages in the standard of living. A considerable percentage represents the lower standards of the countries from which such foreigners come. If they were of the higher class in their own countries, it is unlikely that any great number would have come. If they had been successful among their own people, they would not have looked toward new fields.

Housing and standards of living are closely allied. In England and France there is only slight difference between the standards of living of the artisans of the lowest and highest types, but America, the melting pot of the world, finds every possible standard among its workingmen. Industry would like nothing better than to see its employees all men of a high living standard; this makes for a high working standard.

Such employees demand good housing, and they get it, for if it is not to be found in one place, they will go to another. But what advantage is the housing program to the man who uses one of his rooms in which to keep his chickens, or to the family which uses the bath tub as a place in which to store coal or plant flowers? The man who appreciates a good home does not want the industry to furnish it for him; he wants it for his own, bought with his own money. He has then an interest and a pride in the community that a company-owned palace could not give.

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Improvement in the standard of living does not mean providing good houses, nor will this alone achieve the result. There are many other factors that are essential to the success of housing advancement. But what happens when these factors are all provided—when a man can buy his own home, rear his family in comfort, and partake of some of the better forms of recreation? What happens when he and his family are educated to this stage? He is not content to remain in the pick-and-shovel class, and he is not content that his son's hands shall become calloused; he is determined that his son's education shall fit him for something better.

What will happen as the people become educated to appreciate better and better standards of living, and are in a position to obtain jobs requiring intelligence rather than brawn? As they advance they must be replaced, and to do this it is necessary to draw more labor from immigration channels, each time securing a lower class and one with lower standards of living. And so the cycle is complete. Men are educated to better things, and they expect and obtain better things; but someone has to step into the places in the industry that have been made vacant.

Housing without education is futile and useless; it fails to fulfill its purpose. It is capital thrown away. The primary education that is necessary to make good housing effective is the recognition of the dignity of labor. With a class stratification among the industrial workers, there results merely a cycle of the workman educating himself to better things, and the immigrant stepping in to fill his place. It is not feasible to expect that it will be possible ever to do away with the variable standards of living. Much can be done to Americanize the foreigner, but here again is the same proposition: When he becomes Americanized, his social and industrial position is improved; another foreigner will take his place, and there is another to Americanize.

It will be possible to attain the minimum difference in living standards only when the country's immigration laws have educational clauses, and when the foreign population can begin at somewhere near American standards. This however, must be in combination with the teaching that, in this country, as in European countries, it is dignified to labor.

Then, too, no housing program can be successful until people who have been accustomed to a subnormal standard are taught housekeeping and home-making. A filthy modern house is no more of a home than a filthy shack. Much is being done to emphasize these truths through public-school vocational workers, demonstration agents of the U. S. Department of Agriculture, and many others, but the work has not progressed as rapidly as industrial housing.

Development in connection with industrial housing has advanced considerably, but the accompaniments that will make it successful, if it is to be successful, have merely progressed at a normal rate of speed. If the industrial-housing program gets too far in advance of its support, there is grave danger of reaction, or retrogression. Without doubt, it will make huge strides forward, but the communities in which it will be successful will be those in which the foreign population has been Americanized and educated simultaneously, and in which housing has had a steady and consistent growth. The boom towns will be rusted or decayed when the town that has built homes and taught people to live in them is at its zenith of prosperity.

A consideration for the welfare of workers is a popular fad just now, and, in its speed of travel, it is swinging toward philanthropy. The American workman does not want philanthropy, and the foreign workman does not appreciate it. Placing workmen in homes which they do not know how to use is philanthropy, but the education of the people to want better things, and then providing them, is good business.

Different communities are in various stages of this progress. Some are ready for good housing, and to fail to provide it would be a mistake; but many places are not so situated. It is a goal toward which all should work, for it will do much toward creating industrial and civic harmony and satisfaction.

Japan Interested in Mexican Iron

An authoritative announcement made by the Department of Communications and Public Works of the Mexican government states that it is probable that the famous Iron Mountain at Durango will soon pass into the control of a Japanese syndicate, according to *Iron Trade Review*. Representatives of large iron and steel interests of Japan recently arrived in Mexico to acquire this property, and negotiations have progressed to the point where their consummation is practically assured.

It is planned by the Japanese syndicate to mine and export large quantities of the ore to Japan. The syndicate also is considering the construction of a large iron and steel plant at some point in Mexico, probably Torreon, which is a large distributing center and within easy transportation distance of Durango. With the completion of the construction of the extension of the national railroads of Mexico from Durango to the port of Mazatlan, on the Pacific Coast, a low rate on the downgrade haul of the iron ore should be made available. Japanese ships are now making Mazatlan and other Pacific ports of Mexico regular ports of call.

The iron-bearing formation which rises 700 ft. above the surface of the level plateau just outside the city of Durango is one of the mineral marvels of Mexico. The estimated weight of the mass of ore above the surface is 600,000,000 tons, and the ore is said to be 60 to 67% pure. The deposit extends to an unknown depth below the surface.

It was chiefly to afford an outlet for this ore that the late Collis P. Huntington, who for many years directed the affairs of the Southern Pacific R.R., built what was then known as the Mexican International R.R., from Eagle Pass, Tex., to Durango. Mr. Huntington, in addition to owning extensive coal mines on the line of this road, also purchased the Iron Mountain at Durango for $500,000, gold.

Mount Bischoff Tin Mining Co.

The semi-annual report of the Mount Bischoff Tin Mining Co., covering the latter half of 1918, shows that the property owned by the company and situated in Tasmania—one of the principal low-grade tin mines of the world—produced about 1435½ long tons of 99.87% tin from 2112½ long tons of oxide, which, in turn, was obtained from concentration of 48,730 long tons of ore.

Dividends amounting to £19,500 were paid, and £7890 17s. 1d. was written off for depreciation in value of plant and property. The ore reserves at the end of the year were estimated to amount to 1,125,000 tons, with an average content of 0.29% tin.

Mining in Prehistoric Times

By FRANCIS CHURCH LINCOLN*

An interesting account of prehistoric mining operations. Progress is traced from the flint implements, which are believed to date back half a million years or so, and which were made from a mined material. The evolution from open-pit work to underground mining is shown, and mention made of the method of shaft sinking, tunneling, and hoisting in probable operation about ten thousand years ago. The mining done by American Indians is discussed; and a short account is included of operations of which the first written records, on commemorative tablets, are available.

MINING engineers are fairly well acquainted with the evolution of mining during historic time, but few of them are familiar with the archæological discoveries which throw light on the beginnings of the mining industry. It is reasonable to assume that the industry which is concerned with the production of mineral substances was one of the first to compel the interest and labors of mankind, because mineral products are essential to the preparation or construction of implements of warfare, the chase, agriculture, building, and manufacture. But for proof it is necessary to turn to the geologist and archæologist.

The first mining was undoubtedly a casual form of placer operations, which consisted simply in the selection of suitably shaped mineral fragments from the detrital deposits of the earth's surface. The oldest known bones of man are those of the ape-man, or *Pithecanthropus erectus*, of Java, who is believed to have lived in earliest Pleistocene time, which was about 650,000 years ago. No artificially shaped stones were found associated with his bones, but it is entirely possible that he used natural stones as missiles and even as hammers. Next in age are the remains of the dawn man, or *Eoanthropus*, who lived in England in lower Middle Pleistocene time, approximately 450,000 years ago. With these bones were associated ancient types of Paleolithic flint implements,[1] proving that the dawn man was a flint miner, even if of the most primitive sort.

Neolithic Flint Mines of Europe

Only when the available surface supply of a desired mineral substance was nearly exhausted is it probable that the important step of digging for buried deposits was undertaken. The further great advance from open-pit to underground work was probably made at a much later time. All three of these stages of mining are represented in the neolithic flint mines of Europe. Grand Pressigny, in Indre-et-Loire, France, was the center of a district rich in flint which could be obtained without excavation; and is known to have been the site of a great neolithic flint mining industry by the waste from an extensive workshop where flint implements were manufactured. At Meudon and Champignolles, in Oise, France, there have been discovered neolithic open pits sunk through the chalk to layers of flint by the ancient miners. Finally, at Mur-de-Barrez, in Aveyron, France, at Spiennes, near Mons, in Belgium, and at Brandon, in Norfolk, and Cissbury, in Sussex, England, underground neolithic flint mines have been found and explored.[2] Thus, during the Stone Age mining progressed from the stage of seeking suitable material on the earth's surface, through open-pit work, to rather complex underground operations.

The neolithic flint mines of England, France, and Belgium are the oldest known mines, having been worked during Upper Pleistocene geological time, approximately 10,000 years ago. It was at about this time that plants were first grown for food and animals were first herded, and thus the agricultural industry was born.

Those who like to claim that mining is the most ancient of all industries will be particularly interested to learn that the remains unearthed in the underground flint mines of Cissbury were almost without exception those of wild animals, whereas at Brandon they were nearly all of domestic animals,[3] thus indicating that animal husbandry was not practiced until after mining had progressed to the underground stage.

Primitive Shaft-Sinking and Tunneling.

The mining methods employed in all four of the underground flint-mining districts were similar. Circular shafts were sunk at frequent intervals through the surface soil and underlying chalk till they reached layers of good flints at depths up to 50 ft. From the bottoms of these shafts, galleries were run in all directions along the seam of flints, forming a complete network. These galleries were about 3 ft. in height and from 3 to 9 ft. in width. The tools used in this work consisted of picks, hammers, and wedges made from the antlers of the red deer, and hammers and wedges of flint. The waste from new shafts was cast into old ones and that from working galleries was stowed in abandoned workings. Grooves cut in the chalk at the sides of the shafts indicate that access was by ropes, and that flint and waste were hoisted by them. Roughly shaped cups of chalk found in the mines are thought to have served for lamps.

At Mur-de-Barrez the flint occurred as a solid stratum, instead of as a layer of nodules, and the miners kindled fires in the galleries, using the heat to break up the flint. This is the earliest known example of fire-setting, a process which until the seventeenth century A. D., when black powder was first used in mining, was the only one employed for breaking hard ground.

An archæological age has no definite chronological significance, but serves simply to indicate the degree of civilization attained by a race. The American Indians were still in the Stone Age when Columbus discovered America, and, indeed, had not attained as great a proficiency in mining as had the Europeans about 8500 years earlier. The Indians quarried a variety of substances from widely scattered workings, some of which were of considerable extent. From Mount Kineo, in

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[1]Schuchert, Charles, "Historical Geology," (1915).

[2]Wilson, Thomas, "Arrowheads, Spearheads, and Knives of Prehistoric Times," *Ann. Rep. Smithsonian Inst.*, p. 823 (1897).

[3]Willett, Ernest Henry, "On Flint Workings at Cissbury, Sussex," *Archaeologia*, XLV, Part 2, p. 346 (1880).

Maine, they obtained porphyritic rhyolite; in Mercer County, N. J., they quarried jasper; Sugar Loaf Mountain, Maryland, provided rhyolite; soapstone came from quarries in Virginia, Maryland, and the District of Columbia; quartzite boulders were extracted from the detrital material in the vicinity of Washington, D. C.; Burke and Jefferson counties, Ga., furnished jasper and white and yellow flint; Hernando County, Fla., provided blue flint; and in Alabama mica mines have been discovered and there is an outcrop of quartz from which the Indians obtained all varieties, from rock crystal to jaspar.

In the Middle West, numerous Indian flint mines are found in Ohio and Indiana; there is a white-chert quarry near Mill Creek, Ill.; and novaculite workings are in evidence in Arkansas and Oklahoma, as are a workshop where flint articles were made from the pebbles of an ancient beach at Kenosha, Wis., and native copper pits at Keeweenaw Point, Mich. In Wyoming, there is an extensive Indian quartzite quarry in the Raw Hide Range.

The mention of copper mines might lead one to think that the Indians had reached the Bronze Age, but such was not the case, as they had not discovered that copper could be smelted, and solely mined native copper, which they treated as a malleable stone.[4]

The American Indians mined by open-pit methods. Occasionally they worked beneath a slightly overhanging ledge, or left a small pillar above them; but the nearest approach to real underground mining was made when they extracted flint from within a natural cavern at Wyandotte Cave, Indiana. In that locality a rude stone saucer containing a soft black substance was unearthed. This saucer is believed to have been used as a lamp, and recalls the chalk saucers found in the underground flint mines of Europe.

The Indians used stone hammers and chisels similar to those used by the ancient European miners, and in addition employed wooden crowbars and shovels. In the steatite quarries, they chiseled out annular holes and broke off the cores thus obtained to be worked up into utensils.[5] In Coshocton County, Ohio, traces of fire have been found in the flint mines, and it is thought that there—and also at Flint Ridge, in Licking County—fire-setting was employed by the Indians to break the flint strata, just as at Mur-de-Barrez, in France.

Oldest Mining Records on Stone Tablets

The earliest mining operations of which there is a written account were those conducted by the Egyptians of the Bronze Age in the Sinai Peninsula for turquoise.[6] Large and well-organized expeditions were sent to Sinai as early as the First Dynasty, which began about 3400 B.C., and the commemorative tablets of stone left behind by these expeditions constitute the oldest mining records. The turquoise mines of Sinai were underground mines in sandstone. Cutting was performed mainly with copper chisels, extensive chambers being hewn out of the turquoise-bearing strata with these tools. Occasionally, annular cuts about cores 3 or 4 in. in diameter were made, suggesting the Indian soapstone quarries; but in the Egyptian case the object was to break the ground and not to obtain suitably shaped lumps for manufacturing.

The remarkable quarrying operations conducted by the ancient Egyptians in their own land during the Bronze Age have long been the subject of investigation. The hard rock employed in the construction of pyramids, temples, and monoliths could not be cut with copper chisels, as could the softer rock of the turquoise mines. The tools used were likewise of copper, but were in the form of tubular drills and saws, to which hardness was imparted by the addition of emery dust or the insertion of emery fragments as teeth.

The best known and finest example of ancient Egyptian masonry is that displayed in the Great Pyramid of Cheops, which was begun about 2900 B.C. The roof of this structure is composed of 56 blocks of granite averaging 54 tons each in weight. These stones were secured from the Cataract of the Nile, where any flaws would have been exposed by the action of the water. The blocks were quarried by running grooves and sinking drill-holes 4 in. in diameter, 2 ft. apart, along them. It is thought that the force necessary to free these blocks was obtained by wetting wooden plugs, as no signs of crushing of the granite by hard wedges have been observed.

The Use of Iron in Mining Operations

The earliest known use of iron in mining was by the Athenians at Laurium.[7] The silver-lead mines of that region are first mentioned in the Greek records of about 500 B.C., when the royalties began to figure in the Athenian budget. At Laurium extensive underground mining operations were conducted with slave labor, having for their object the extraction of irregular masses of argentiferous galena lying at slate-limestone junctions. Both overhand and underhand stoping was practiced, and filling or pillars were employed to support the stopes when necessary. The tools used included hammers and gads of tempered steel, similar in design to those of the present day, together with steel picks and scrapers of antique pattern. The development workings were kept as small as possible to minimize labor and timbering. Occasionally olive-wood posts and caps were employed. Transportation of ore and waste was by pack-baskets on the backs of slaves. Lighting was effected by means of oil lamps made of terra cotta. When natural ventilation proved insufficient, furnaces were constructed and a forced draft was secured.

The mines of Laurium provided the sinews of war that gave Athens its ascendency in the ancient world. With Laurium we pass from the realms of archæology onto those of history, and thus bring the present article to a natural end.

Finding Concealed Water Pipes.—An electrical method of determining the location of pipes concealed within walls, has, according to the "South African Journal of Industries," recently been patented. The apparatus is made up of two sets of coils placed on the ends of a magnet bar. One set of coils receives alternating or vibratory current, and the other is connected to a telephone. The balance is first established so that no sound is heard in the telephone. When the device comes near the metal piping this disturbs the balance, and a sound is heard, thus indicating the locality of the pipes. The value of this invention exists in the saving effected in disturbing as little of the wall as possible when repairs to pipes are necessary.

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[4] Whittlesey, Charles, "Ancient Mining on the Shores of Lake Superior," Smith. Con. to *Knowledge*, 13, Article IV (1863).

[5] Holmes, William Henry, "Stone Implements of the Potomac-Chesapeake Tidewater Province," 15th Ann. Rep. Bur. Ethnology (1897).

[6] Petrie, W. M. Flinders, "Researches in Sinai," New York (1906).

[7] Ardaillon, Edouard, "Les Mines du Laurion dans l'Antiquité," Paris (1897).

The Engineer and Reconstruction*

By W. F. STAUNTON

I WISH to record the great satisfaction with which I have read Mr. Ingalls' address of Jan. 14 last, as retiring president, on "The Economic Duties of the Engineer." The common drift of thought toward many of the ideas Mr. Ingalls expressed, among those of our profession whose practical attainments have made them leaders, in position to give publicity to their views, and therefore wielders of influence, is striking and reassuring to those who, like myself, believe that the engineer must take an increasingly active part (and quickly) in the reconstruction and operation of the social machine if our country is to maintain its place in the world. Perhaps I should go further and say, if it is to avoid disaster from trying working-scale experiments which a slight knowledge of history and the fundamentals of economics should prevent.

"The Economic Duties of the Engineer" comes as a most important addition to Channing's "Man-Power," Kemp's "The Human Side of Mining Engineering," Finlay's "Readjustment, Not Reconstruction," and, to go outside of our immediate circle, Secretary Lane's "Americanization."

To this splendid array we could all add the titles of many more articles brimming with uplifting thoughts on the great problems now before the world. We listen, or read, and agree, just as we do when we go to church; but do not most of us slide gently back into our habitual grooves and leave "George" to do the rest? I think that many, perhaps most of us, do. And yet we have before us problems compared with which those involved in going to war may prove to have been easy. There will be no flags, bands, and uniforms as stimuli, nor the exuberant appropriation of billions to accomplish results regardless of the consideration of unit costs, as compared with other countries. Economic laws, so lately suspended, will be in relentless operation. Efficiency of labor, which, owing to the prodigious market that has existed and the necessity of getting things quickly regardless of cost, has declined alarmingly with us, has, on the other hand, increased abroad; a production per man of ten times the pre-war rate having been reached in some lines, according to eminent authority. A severe jolt to our complacency of superiority seems unavoidable when normal competition returns.

What, in a practical way, are we going to do about it? What, in a word, is the solution of our problem? I believe it is education; but not that sort of thing which comes to the mind of the school-trained man when the word is used—a vision of books and apparatus—but rather a knowledge of those simple, homely, historic, economic, ethic truths that man in his painful upward progress has again and again verified by the ghastly failure of experiments which this generation seems now about to repeat. Education is the keynote of Secretary Lane's "Americanization"; but even in that masterly appeal one can wish for more emphasis on the elemental principles.

The English language should be first, of course, for those ignorant of it, but, after that, as between imparting the power given by the "three R's," to be exercised in absorbing poisonous misinformation from the yellow press and reckless propaganda in general, and a knowledge of how to think clearly in the problems of everyday life, I choose the latter; but why not have both?

My observation is that not many even fairly enlightened persons that one meets can give a clear and logical explanation of capital—what it is, its origin, its benefit to all, laborers included; and why it is necessary for any material progress, whether under individualism, socialism, or any other "ism." So in regard to what is possible in the long run in the payment of wages; that the market value of the things produced sets an absolute limit to them; that no legislation or strikes can change this condition, notwithstanding that an occasional professor arises to testify that the basis of minimum wages should be made by law the cost of a comfortable living, a condition we would surely all welcome, if true. But the place man is making for himself in the universe is an artificial one, and is maintained only by his successful struggle to redirect forces tending otherwise, and it is success in this struggle and consciousness of ability to succeed that give man's intelligence its godlike potentiality, develop his strength, and support the hope of progress. So the elementary idea should be taught that the things worth having, even those altruistic in character, are only the rewards of effort of muscle and brain, and not within the power of legislatures or unions to bestow.

The conception of "freedom," too, needs clarifying. The more we hear of it lately, the less there seems to be. There is none when the laws guaranteeing a man protection from violence in the pursuit of his ordinary avocations are a dead letter and when his head may be broken with impunity or approval if he fails to join a particular organization which he does not want to join for possibly very good reasons of his own. What unjust strike could succeed if unlawful violence were made impossible? The unions and collective bargaining have come to stay; their justification is their undoubted improvement in the workers' economic status. As their potentiality for good is tremendous, so it is also for harm, to the workers themselves and society in general. The result of their unrestrained development needs no prediction. Fighting the abuse of their advancing arbitrary power, and the inevitable train of needlessly repeated experimentation, by the exercise of another arbitrary power, is unintelligent, and enlightenment by education in the fundamentals of economics and ethics is the only way in which these agencies can be effectively dealt with; preserving the good and eliminating the evil. It is not too much to hope that some day membership in good standing in a trade union will be a guaranty of proficiency and integrity, instead of a danger signal.

The practical wisdom (aside from any other reason) of a system of ethics should be made plain, and the fact that theists of all kinds, agnostics, atheists, even pagans, and probably Germans, appreciate and in their hearts and minds really believe in the essential truth of the broad principles of morality taught by Christ, and that the most rapid development of the human race, not alone in material things but also in the average of individual well-being and happiness, is coincident with the Christian era.

*Abstracted from the Mar. 31 *Bulletin* of the M. M. S. A.

I do not know how others feel, but for my part I cannot help ascribing a part at least of the unrest at the bottom of much of the present turmoil to the fading away of old religious beliefs without the substitution of other guides. With the disappearance of the blind acceptance of constituted authority, physical and moral, which we have seen everywhere, has come the dawn of an attempt to analyze the situation without the guide of an historical or economic knowledge. We can imagine a new Russian thinking: "I find myself here on this planet wholly without my consent. I see others around me with far more of the things that make life pleasant; indeed, the sole occupation of many seems to be to devise new means of enjoyment, while I slave along on a pittance. To be sure, they say that rules have been made permitting this condition, but I did not agree to these, and it even appears that these rules were made by people most of whom are now dead, and that they are perpetuated and revised by a small minority of those now here; the others not bothering themselves to express themselves one way or another. I decline to recognize these rules, and I am going to get what I want in any way I can. The game was evidently rigged by a lot of people who happened to be here first, and I don't propose to stand for it."

Perhaps not many have formulated the proposition in as raw a fashion as this, but there is little doubt of the growth of some such feeling, and nothing but education can combat it.

Fortunately the kind of education needed is elementary in the extreme, and not of a kind requiring much time or study. We can all be teachers in such a school; but in this, as in other things in this world, the same old competitive system on which everything is planned is still in operation, and we have formidable competitors. Since the growth of conscious power from organization, which has come largely within the lifetime of many of us, we have been forcibly reminded that great mental ability is quite compatible with moral obliquity, and that such mental ability can be hired for unworthy purposes. Many of the organizations we shall have to deal with are possessed of abundant financial means, and with their great memberships can, and do, accumulate formidable sums from trifling individual payments, which sums constitute an irresistible temptation to brilliant but unscrupulous minds. Also, we have the venal yellow press, where control by one vicious mind permits feeding mental poison literally to millions. These are the worms at the root. Many people have derived their whole educations among the branches and twigs of the tree of knowledge and know nothing about the roots and trunk, at which a busy little worm may be conducting operations, the effects of which they see among the leaves, and try to combat with futile local treatment.

Mr. Finlay has the happy faculty of going to the foundation of things and building thereon structures in which one cannot help feeling confidence. His "Readjustment, Not Reconstruction" is a delight to one who believes in beginning at the beginning—setting up as he does a row of axioms and building his argument firmly thereon. It is something like that which the enlightened people of the world must do to steady the tottering structure of civilization. We must get down to the foundations and make them secure; patching up the cracks afterward. Fixing foundations is preëminently an engineering job. It must be done by enlightened propaganda, elementary education, pounded into every crack and crevice that can be found, and, judging by the startling manifestations we are daily witnessing here, there and everywhere throughout the world, there is no time to lose.

In old times, ideas traveled slowly, but today they are flashed to every corner of the world. That good ones can be spread quickly, and that they will take effect with marvelous results, is shown by looking back at Hoover's work in food conservation, where a few simple, vital facts were spread like wildfire, found ready acceptance, accomplished the apparently impossible, and prevented the loss of the war, already privately conceded by Lord Rhonda on account of the assumed inevitable failure of the food supply. Something like that can be done in back-firing against the social conflagration.

This country is full of organizations. There are clubs and societies by the thousand, ostensibly for this, that, and the other thing, but most of them in eager search for a really interesting object, notwithstanding their titles. They overlap, and their members touch elbows constantly. They are mostly composed of rather enlightened people, employers of others in large and small degree, but in the aggregate enormous, their members moving about so as to increase the points of contact to an extent that would make the spreading of propaganda (if such spreading should become interesting) well-nigh perfect. They constitute a possible means of combating social heresies that could hardly be improved.

The Stanford School of Mines*

BY JAMES PERRIN SMITH

At the meeting of the board of trustees of Stanford University held on Mar. 28, 1919, Theodore J. Hoover was appointed professor of mining and metallurgy. This appointment marks a new period in the development of the teaching of mining and metallurgy at the university. Plans are now being formulated so that these subjects will be handled under Professor Hoover's direction, rather than in close association with geology, as has been the practice.

The aim is for mining and metallurgy to be organized as a graduate course leading to the degree of engineer of mines. Candidates for admission will be trained largely in the department of geology, chemistry, engineering, and allied subjects, and such candidates will present as qualifications for admission the degree of A. B. from Stanford or its equivalent from some other institution. There will be active coöperation with the departments of geology, chemistry, and others, and the pre-mining courses will be designed to give prospective mining engineers a broad foundation in science, language, English, economics, and history, upon which foundation will be superimposed the two years' work leading up to the degree of engineer of mines.

Special attention will be given to the mining and metallurgy of the metals, and emphasis will be continued on the branch of petroleum technology. In addition to technical education, the division of technical research, as it applies to the unsolved problems in the utilization of the natural resources of California, will receive active attention.

Theodore Hoover was born at West Branch, Iowa, in 1871. He attended Friends' Pacific Academy, at New-

*Excerpt from the *Stanford Illustrated Review.*

berg, Ore., and Penn College (Friends), Oskaloosa, Iowa; and was graduated from Stanford University with the degree of A. B., geology and mining, in 1901. In 1902 he was assayer for the Keystone Consolidated Mining Co., Amador City, Calif. In 1903 he was assistant manager of the Standard Consolidated Mining Co., Bodie, Calif. In 1904-5 he was manager for the Standard Consolidated Mining Co., Bodie, Calif. In 1906 he was consulting engineer for the Cosmopolitan Proprietary, Ltd., in London and Mexico. In 1907 he was general manager of the Minerals Separation, Ltd., London.

In 1910 Mr. Hoover was made consulting engineer for Minerals Separation, Ltd., London. It was during his connection with the latter company that he developed the flotation process of ore concentration and applied it successfully to the treatment of the ores at Broken Hill, New South Wales. This period also gave him the opportunity and material for his book on concentrating ores by flotation, which has run through three editions and is still an authoritative text on this art.

During 1911-19 Mr. Hoover was consulting engineer at No. 1, London Wall Buildings, London Wall, London, and Mills Building, San Francisco; managing director of Zinc Corporation, Ltd., Lake View and Oroya Exploration, Ltd.; director of Star Exploration, Ltd., Oroya Links, Ltd., Oroville Dredging Co., Ltd., Pato Mines, Ltd., Nechi Mines, Ltd., Mawchi Mines, Ltd., Granville Mining Co., Ltd., Natomas Land and Dredging Trust, Ltd.; chairman of Yuammi Gold Mines, Ltd., Central American Mines, Ltd., Babilonia Gold Mines, Ltd., Carnon Valley Tin Mines, Ltd.; president Oroville Dredging, Ltd.; consulting engineer Burma Corporation, Ltd., Messina Development Co., Ltd. In all of these positions he has demonstrated executive and administrative ability, combined with financial and engineering skill. In the course of his professional work, Mr. Hoover has traveled extensively in Australia, Mexico, India, Russia, Finland, Germany, France, and Asia Minor, and has thus visited practically every mining center in those countries.

As an undergraduate Hoover began his professional career in Amador City, as assayer at the famous Keystone mine, in Amador County, and upon graduation went back to that mine on the technical staff. Thus the classic Mother Lode was his training school, as it was of his brother, H. C. Hoover, of W. A. Prichard, and many other now famous engineers.

About this time an event happened that showed Hoover's foresight. He was on a visit to his old friends at Stanford and asked the writer of this review to go over to Waddell Creek on a fishing trip. On reaching Waddell we did actually fish, but Hoover disclosed to me that the primary object was not to fish but to look over the land. He hoped some day to be able to retire from active work in his profession, and wished to find a suitable place for a country home that would be at the same time a profitable investment and a desirable place in which to live. We agreed that he had found it. Then both kept quiet about it, and nearly ten years later Hoover bought the place.

In the meantime Hoover went about his business, becoming in turn manager of the various mines in different parts of the world already mentioned. As soon as it was possible, Hoover left the wearing work of foreign travel and turned back to Waddell Creek, realizing the dream of his student days, building up a model ranch and country home, where he raises his own cattle, sees the deer feeding on the hills, and catches trout out of the clear waters of Waddell Creek that caught his fancy in the old days.

Copper Country Mine Inspectors Meet

A conference of Michigan county mine inspectors and safety engineers was held at Houghton, Mich., on Apr. 23, 24, and 25, the meeting having been arranged by B. O. Pickard, representing the Bureau of Mines in the Lake Superior district, and F. W. Sperr, professor of mining at the Michigan College of Mines.

One of the principal subjects discussed was that of standardized mine-inspection reports, by means of which it will be possible to obtain a comprehensive idea of all accidents occurring in a state or a large mining district. Mr. Pickard believed that the report of the Marquette County inspector, one in use for years, is the best suited to the needs of all. It differs from the Houghton County report—for example, in that it includes accidents other than fatal ones underground and also separately reports on fatal, serious, and slight accidents on surface. The sample report submitted showed that in Marquette County mining there are nearly as many fatal accidents on surface as there are underground.

MINE INSPECTORS AND SAFETY ENGINEERS AT HOUGHTON

The Michigan mine inspectors are handicapped by the lack of state supervision, or, rather, of a central state authority to which they should report and to which they should look for guidance. It appears that the making of an annual report by a mine inspector is not compulsory as a state matter. Where the county boards of supervisors do not require it, the inspector makes no report, or one that is perfunctory and insufficient. The deficiency has been supplied in late years by the Bureau of Mines, which is a guide and aid to the inspector.

A photograph of those attending the conference is reproduced herewith. In the foreground is a group of Michigan College of Mines students, who demonstrated the use of oxygen helmets. In the center of the picture is C. E. Julihn, superintendent of the Bureau of Mines experiment station at the University of Minnesota. Others attending the meeting were: H. C. Juseen, Negaunee; G. H. Lohneis, Virginia, Minn.; Theodore Roy, Hurley, Wis., Republic Iron and Steel Co.; Byron D. Shove, Ironwood, Oliver Iron Mining Co.; John Brinkman, Keweenaw County; Gust Heikkila, Kewee-

naw County; J. P. Chapple, Iron Mountain, Oliver Iron Mining Co.; James Yelland, Marquette County; Frank Larson, Dickinson County; Fred B. Mitchell, Iron County; Henry J. King, Alfred James, Houghton County; Thomas Thompson, Palatka, Pickands, Mather & Co.; F. O. Bailey, Calumet & Hecla; Robert Eva, Ontonagon County.

Carranza's Oil-Lands Policy

The Mexican Congress convened on May 1, and late press dispatches indicate that President Carranza has outlined an important program. That part of Carranza's message dealing with the petroleum and mining industry is given in the following paragraphs, which are reprinted from the New York *Tribune*:

"The formation of a petroleum organic law, and one concerning combustible minerals, becomes more vital every day. Fortunately, the senators and members of the Chamber of Deputies share in the executive's desire to consolidate the sources of natural riches in accordance with law and equity. When we suggested the regulation of law and equity and asked for a revision of Article 27 of the Constitution (which nationalizes certain national resources, particularly petroleum lands), we were far from suggesting a rigid system which would entail the absorption of these properties by the state and so damage foreign business men.

"It is planned precisely to destroy any special privilege and to equalize the judicial status of Mexican citizens and subjects of other countries, without the nation claiming more preëminence than that given by national sovereignty, which rights nobody has brought up for discussion in connection with other sources of riches of which Mexico is an exceptional producer, such as mining, for example. Nothing can be discovered in the projected law, even by examining the sections which might be judged the most radical, that is not contained in previous legislation or in the statutes of colonial times (during Spanish domination). The rights of third parties which have been acquired in equitable form would be respected by the proposed law when those rights have a basis not contrary to our laws. This measure deserves the sanction of Congress.

"The participation of the state under the proposed law is less than that imposed by other nations for petroleum production. With regard to the laws for the public welfare and private well-being of the people, the executive power has had no other guide than strict equity."

Mining in Chihuahua

The State of Chihuahua is the largest in Mexico, comprising an area of 90,000 square miles and having a population of about 275,000, says a consular report. Economic conditions were better in 1918 than in either 1916 or 1917, as the reduction of bandit activity permitted the reopening of the large smeltery at Chihuahua and a number of the larger silver and lead mines at or near Chihuahua, Parral, Santa Eulalia, and Cusihuiriachic.

When the roving bandits in the state are suppressed, and mines and farms can be worked in safety, there will be unusual demands for mining machinery and supplies, agricultural implements, hardware, and railway equipment and supplies, as it is the general belief that the Chihuahua mining camps will then enter upon a period of prosperity such as they have never before experienced.

Chihuahua is considered the richest state in Mexico in mineral resources; consequently, the leading industry is the mining and smelting of silver, gold, lead, copper, zinc, and, during the last year, manganese. It was possible in 1918 to work only those mines at or near large mining camps. Several mines which had been closed for some time reopened during the year, and their output, added to the increased production later in the year of the other mines which were operating, made the total for the last six months about twice that of the first half of the year.

The estimated contents of ores and bullion declared at Chihuahua during nine months of 1918 and the entire year of 1915 were: Copper—1915, 38,943 lb.; 1918, 15,225 lb.; gold—1915, 31,691 oz.; 1918, 9604 oz.; lead 1915, 20,620,885 lb.; 1918, 35,715,232 lb.; silver—1915, 6,445,680 oz.; 1918, 4,341,376 oz.; zinc—1915, 5,639,-017 pounds.

The American Smelting and Refining Co.'s smeltery was reopened in April after having been closed for two years, and continued operations throughout the year at full capacity and without interruptions, smelting about 240,000 tons of ore. Most of the mines are dependent upon it and would not be able to run were it closed. All the concrete work necessary for the mechanical handling of large quantities of ore was completed. When the present plans are finally completed this district will possess the largest lead smeltery in the world. The plant was built at a cost of about $1,000,000, U. S. currency, and the improvements and enlargements under construction call for an additional outlay of $2,000,-000, almost half of which expenditure for betterments was made last year.

The San Francisco Mines of Mexico (British), situated in the Parral district, installed and began operating a flotation process mill in 1918. The Cusi Mining Co. (American), at Cusihuiriachic, started construction on a similar mill for the flotation of its lower-grade silver ores. The large Canadian power and irrigation company, Cia. Agricola y de Fuerza Electrica del Rio Conchos, extended distribution power lines from Parral to the following mining camps: San Francisco del Oro, Santa Barbara, and Minas Nuevas.

Alaska Gold Mines Co.

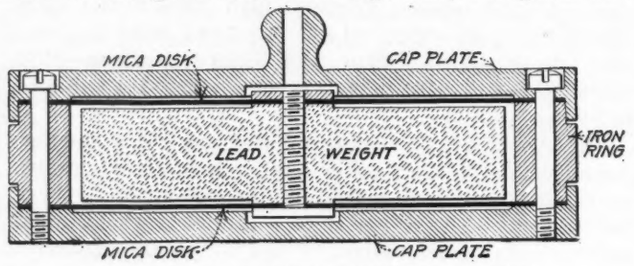
The seventh annual report of the Alaska Gold Mines Co., for the year ended Dec. 31, 1918, shows that 1,285,-445 tons of ore was milled, containing gold of an average value of $1.09 per ton. The extraction amounted to 81% and the operating expenses to 96c. per ton. A net loss of 8c. per ton was, therefore, recorded. An increase in operating expenses of 19c. per ton was due to low tonnage treated during the period; there was an increase in the cost of supplies of 16.75%, of wages 12%, and a lack of skilled operators.

By the end of February, 1919, the tonnage being handled had risen to 6000 per day, and a corresponding reduction in operating costs may be anticipated during 1919. Broken ore in the stopes has been estimated at 2,000,000 tons. The tonnage in reserve, broken and unbroken, but prospected and prepared in the block of ground between No. 2 shaft and the west end of the property above No. 13 level, is estimated at 6,323,117, with a gold content valued at $1.02 per ton.

The Geophone

THE geophone, a "listening" instrument invented by the French to detect enemy sapping and underground mining operations and for ascertaining the position of enemy artillery, is now being used by the Bureau of Mines as a possible aid in establishing the location of miners who have been entombed after a disaster. The instrument was developed by United States engineers during the war, and is now used by the Bureau according to plans drawn by these engineers.

Alan Leighton, assistant chemist of the Bureau, who now has charge of these investigations, has given the



DETAIL OF GEOPHONE CONSTRUCTION

following statement of general information regarding the geophone:

The instrument, though small, is essentially a seismograph. It consists of an iron ring about 3½ in. in diameter, within the center of which is suspended a lead disk which is fastened by a single bolt through two mica disks, one of which covers the top and the other the bottom of the ring. There are, in addition, two brass cap pieces, the top one having an opening in its center, to which is fastened a rubber tube, leading to a stethoscopic ear piece. The cap pieces are fastened with bolts to the iron ring and serve also to hold the mica disks in place.

If the instrument is placed on the ground, and any one is pounding or digging in the vicinity, energy is transmitted as wave motion to the earth, and the earth-waves shake the geophone case. The lead weight, on account of its mass and because it is suspended between the mica sheets, remains comparatively motionless. The result is that a compression and rarefication of the air in the instrument takes place. As the rubber tube leading to the stethoscopic ear piece is connected with this space in the geophone, this rarefication and compression is carried to the ear drum. Usually two instruments are employed, one for each ear.

When the two instruments are used, it has been found that the sound is apparently louder from the instrument nearer to its source. It is evident, then, that by moving the instruments properly a point can be found when the sound will be of the same apparent intensity in both ears. The direction of the sound is then on a perpendicular to the line connecting the centers of the two instruments either in front of or behind the observer. Further observation will show which side. Approximate direction is then accurately determined.

During the period of the war, engineers of the Mining Division of the Bureau of Mines were engaged in determining the distance through the clay, shale, coal, and the mine cover that different mining machines could be heard. Measurements were made, also, of the energy required in blows that could be heard for definite distances through clay, shale, and coal, as well as the distances at which the shock waves resulting from the discharge of various explosives could be audibly recorded.

In this connection it was found that sounds were transmitted only about half as far in clay as in shale strata, and about one quarter as far in clay as in coal. The sensitiveness of the instrument is such that pounding with a pick on the bituminous coal can be detected for a distance of 900 ft., and the direction determined, and pounding with a sledge can be heard as far as 1150 ft. These measurements were made in the Pittsburgh coal seam in the vicinity of Pittsburgh, where the coal is somewhat harder than in most other bituminous coal beds. The explosion of a 1-oz. charge of dynamite was detected a distance of over 2000 ft. through shale strata. One interesting feature of the instruments is that the sound as transmitted to the ear is markedly characteristic of the instrument producing the sound.

It is thought that the geophone will be of value to mine rescue crews who may be entering mines for exploration and for the purpose of finding miners who may have been entombed after a disaster. The tests

USING THE GEOPHONE

so far made in the vicinity of Pittsburgh show that a man pounding on the coal rib with a pick, piece of timber, or a sledge can be detected and his position determined from a point 600 to 1200 ft. distant. The distance depends mainly on the character of the coal upon which the man is pounding, and intervening rooms and entries seem to have surprisingly little effect upon the distance or the determination of direction.

Pounding with a sledge can be heard from 200 to 300 ft. through the mine cover, the distance depending upon climatic conditions, as wind interferes greatly with

the successful operation of the instruments. A study is also being made of the distances that pounding on rails and pipes can be heard. As rails are generally buried in the earth or dust on the entries of a mine, and because this dust damps the transmission of the sound, it is not transmitted well. The same is true of pipe lines. However, if pipe lines are not buried, but are laid on blocks and ties, pounding can be heard for great distances. So far no lines have been found long enough to show the limit of the geophones. It is known, however, that the ear can detect, without artificial aid, sounds made more than 2000 ft. distant.

In metal mines, expensive surveys sometimes have to be made, so that approaching tunnel headings may be brought together accurately. As direction can be determined so well with the geophones, it is thought that they can be utilized to advantage to guide such work. It would simply be necessary to go into each heading and determine the direction from which pounding in the other heading was coming.

Credits to Foreign Purchasers

Charles H. Sabin, president of the Guaranty Trust Co. of New York, in a statement issued on Apr. 19, calls attention to the advisability of granting more liberal credits to foreign purchasers of American products. Mr. Sabin advocates the meeting of international competition by the extension of longer credits than American business men have given heretofore, and says:

"The war forced us into the world markets on a scale not before dreamed possible. We are beginning to realize that our national prosperity is materially dependent upon the continuation of our vastly increased production, which exceeds the requirements of our own market and must continue to find an adequate outlet elsewhere. But, owing to the war, other peoples cannot pay us on practically a cash basis for the goods which they want to purchase from us, and which they sorely need. Consequently, we must allow them more time in which to meet their obligations. We must revise our point of view about foreign credits. Our banks can no longer restrict such credits to 60, 90, or 120 days, and render to manufacturers and exporters the service which the present readjustment period makes imperative.

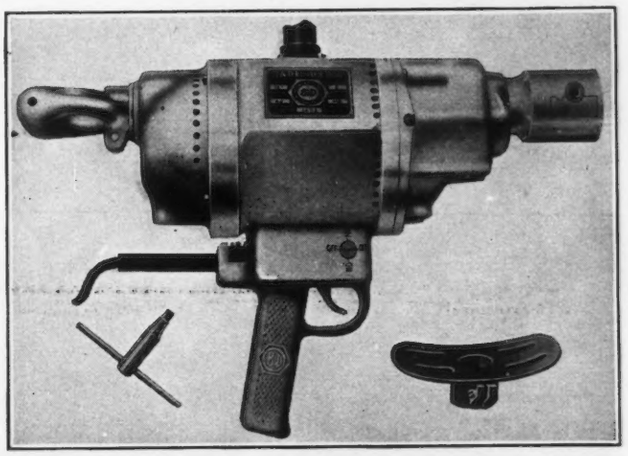
"England and Germany built up their great foreign trade prior to 1914 largely by making six months' time the selling basis for their goods. If we are to hold our own in foreign trade, we must profit by the experience of other countries and adapt ourselves to the needs of the present situation. The war has taught us many lessons; peace will teach us more. We have learned, for instance, that our existing banking system is the strongest in the world. But we must develop greater elasticity in our banking methods, particularly with regard to credits for fostering foreign trade. This is especially demanded in the selling of manufactured articles overseas, although it holds true to some extent in the selling of raw materials also.

"The recent unpegging of sterling and franc exchange has made clear to us the condition which is bound to prevail if we continue to insist upon the short-term credits which we have held to in the past. When the British and French governments withdrew their support to sterling and franc exchange, respectively, the tendency was to put the American dollar at a premium in England and France, which means that it takes more francs and shillings to equal a dollar, and, consequently, less imported goods can be purchased for an American dollar in those countries than was possible prior to the unpegging of the exchanges. This will tend to discourage the buying of American goods, and eventually will result in serious curtailment of our foreign trade unless we counteract that tendency by extending credits for a sufficient period to enable purchasers of our products abroad to pay us at a more convenient time."

A Portable Electric Drill

The outstanding feature of the ½-in. portable electric drill shown in the illustration is its method of control, the "pistol grip and trigger switch," which make it possible to handle the drill in the same manner that an automatic pistol is grasped—one pull on the trigger turns the current on and the next pull turns it off. This arrangement enables the operator to control the drill practically automatically, without having to change the position of his hands to manipulate the switch. An indicator is provided showing when the switch is on and when it is off.

The drill is equipped with a ½-hp. motor. Its full-load current consumption is about 700 watts, and the no-load speed 600 r.p.m. The housing is of aluminum alloy, completely enclosing the motor and gears, and the total weight of the machine is 21½ lb. The electric



DETAIL OF PORTABLE ELECTRIC DRILL

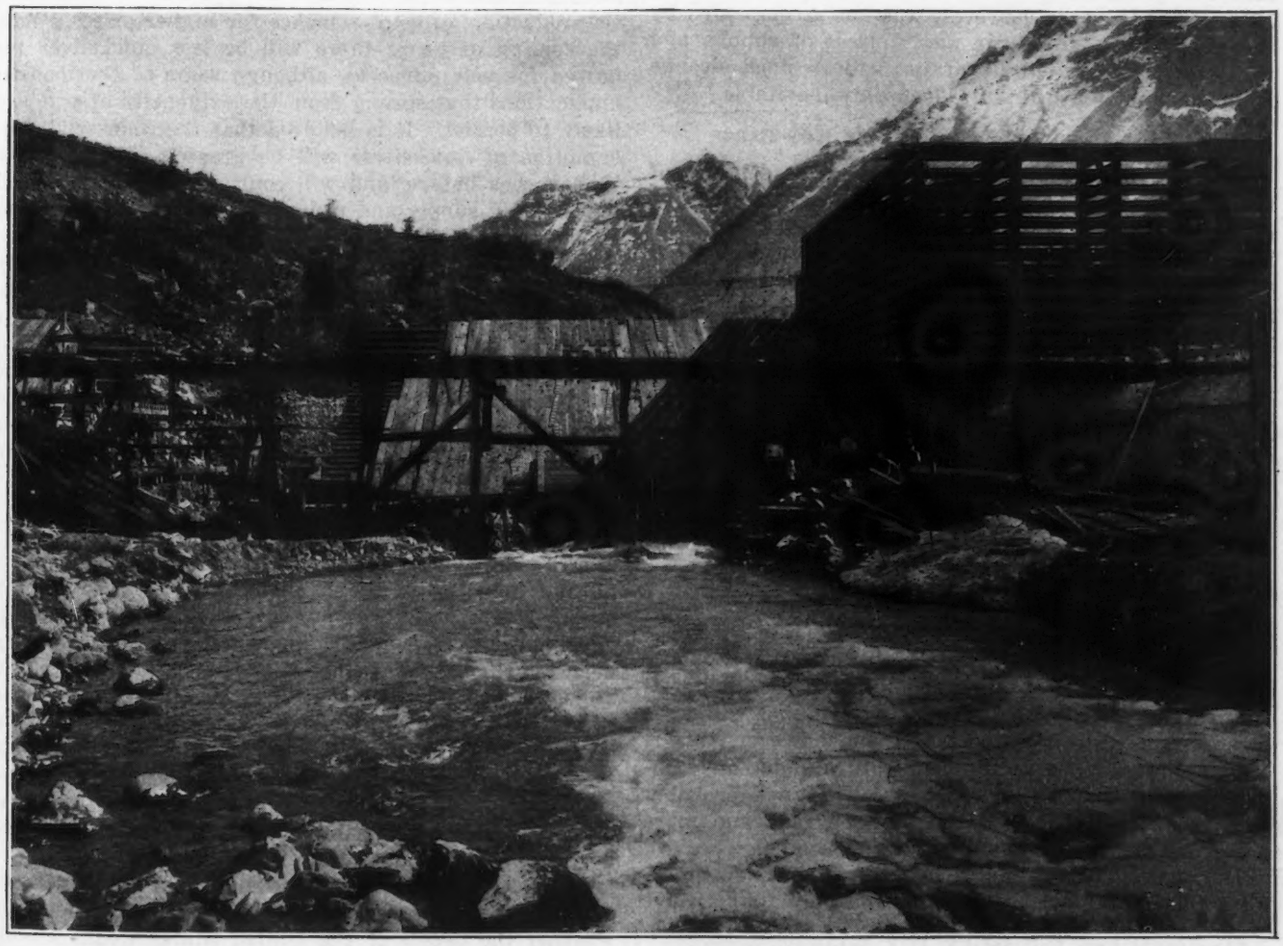
motor is series compensated wound, interpolar type, and uses direct current or 25-, 40-, or 60-cycle alternating current, and will operate from any two wires of a three-phase circuit. Motor is air-cooled by means of a centrifugal fan mounted on the armature shaft, which draws air in at one end of the motor and expels it at the other. The gears are cut from high-carbon steel, mounted on ground shafts, and operate in grease in a separate grease-tight compartment. The drill spindle runs in a long bronze bushing against a ball thrust bearing. The commutator end cover is entirely separate from the armature shaft bearing, and is, therefore, easily removable for inspection and adjustment of brushes. This also eliminates the possibility of the armature shaft binding in the bearing, in case the end cover is accidentally distorted by dropping the drill or by exerting excess pressure on the feed screw. The drill is manufactured by the Black & Decker Manufacturing Co., Baltimore, Md.

Mining Progress in South America

TYPICAL VIEW OF COUNTRY THROUGH WHICH BRADEN COPPER CO.'S RAILROAD PASSES

SITE OF NEW SMELTERY AT CALETONES, CHILE

COYA CAMP AND 13,000-KW. POWER HOUSE, WHICH OPERATES UNDER 435-FT. HEAD



WOOD CRIB AND ROCK DIVERSION DAM UNDER CONSTRUCTION FOR PANGAL POWER PROJECT

Future of the Quicksilver-Mining Industry in the United States*

By F. L. Ransome

An appraisal of the quicksilver resources of the United States based on actual measurements and estimates of the quantity of ore available in individual deposits presents insuperable practical difficulties. The best that can be done is to reach a rough conclusion from the history of the industry and from general knowledge and impressions of its present status and of the condition of known deposits. It is also necessary to take into account the probability of the discovery of new deposits and of improvements in metallurgy.

Records show that quicksilver mining in the United States has generally declined since 1877, when the domestic production reached its peak, with 79,395 flasks. The output sank in 1914 to 16,548 flasks. Although not uniformly retrogressive, the decline was on the whole fairly regular and on this account the more ominous.

The price has not declined at the same rate as the output. In 1877, the year of maximum yield, quicksilver was worth only $37.30 a flask. In 1890 it had risen to $52.50 a flask, and in 1914 it was $49.05 a flask. Production has failed to respond to the stimulation of moderate increases in price, and the conclusion that the supply of ore has on the whole been decreasing in tenor and available quantity since 1877 appears to be warranted by the historical record. It is true that under the influence of unprecedentedly high prices during the recent war years the production rose to 36,159 flasks in 1917. This increase, however, was not accompanied by the discovery of any large new sources of supply, and that the domestic output of quicksilver must decline from the point reached in 1917 appears inevitable.

U. S. Quicksilver Deposits Are Not Large

A wide survey of the known quicksilver deposits of the country confirms the conclusion drawn from historical and statistical data. The deposits, with few exceptions, are not large, most of them probably do not extend to great depth, and many of them are of decidedly superficial character. Even if the ore at certain localities does continue to a depth of 1000 ft. or more, some of the deeper orebodies, in consequence of their irregularity and lack of continuity, are likely to remain undiscovered. Certain mines at present the most productive have in all probability passed their period of greatest yield, although there is still a possibility that the discovery of new orebodies may restore them temporarily to something like their former activity.

There are in California a large number of old quicksilver mines which have been productive, but which have lain idle for years and which even the unprecedented prices obtainable for quicksilver during the last three years failed to revivify. Some of these are probably exhausted. Others contain orebodies or at least material that carries some quicksilver, and these mines will some day be reopened. For most of them, however, this is not likely to happen in the near future under any conditions that can now be foreseen. They will probably remain undisturbed until the higher grade and more accessible deposits of the world are exhausted.

During the last 20 years comparatively few new quicksilver deposits have been found, and only four or five of these have produced more than a few hundred flasks each. Of the total domestic production of 36,159 flasks in 1917, fewer than 600 flasks came from new mines opened during the war period, and not one of these promises to develop a production of 1000 flasks or more annually. The exploitation of the Terlingua district represents a notable modern addition to the known quicksilver resources of the country. Other regions capable of as great or greater production may be awaiting discovery, but as years pass the possibility is diminishing, and it is now hardly probable that any other locality with the potential productivity of the Terlingua district will be discovered in the country.

It appears, on the whole, that quicksilver mining in the United States must be regarded as a declining industry, in which, however, there is still opportunity for individual success, not only in working known deposits but in discovering and devoloping new ones. During the next 10 years the annual output may be expected to fall to 15,000 flasks or less. Prices, of course, will affect the output, but they cannot change the physical conditions upon which production fundamentally depends. The high prices obtainable during the war nearly tripled the annual output, but the same or even higher prices could not again produce the same result.

The price of quicksilver in the United States during the next few years will depend upon so many uncertain factors that prediction is extremely hazardous. Among the determining conditions may be mentioned changes in the uses of quicksilver, the cost of labor and supplies, the quantity and price of foreign quicksilver available, and tariff legislation. The decline of domestic production, of course, makes for higher prices. With the coming of peace there will be less quicksilver required for war purposes, although some of the modern applications that sprang from the exigencies of war are likely to persist. It is believed that the industrial consumption of quicksilver will be greater after the war than it was before, and will continue to increase until diminishing supply and rising price force the extensive employment of substitutes.

Quicksilver can undoubtedly be produced more cheaply abroad, especially in Spain, than in the United States, but it is doubtful whether this country will in the near future be deluged with foreign quicksilver to the extent feared by some domestic producers. Self-interest alone on the part of importers and foreign dealers would seem to preclude an attempt to lower the price in this country to anything near the cost of production in Spain.

Quicksilver Industry and Import Duty

The plan of attempting to maintain the quicksilver-mining industry in the United States by a high duty on imported metal has many advocates among the quicksilver producers, whose representatives at a hearing held by the Tariff Commission in San Francisco in June, 1918, asked for a duty of $35 a flask in addition to the present 10% *ad valorem*. Such a duty would increase the profits of some of the larger mines, but would not transform a declining industry into a growing and self-supporting one. It is doubtful whether there is any wisdom in attempting to foster quicksilver mining by a high import duty the effect of which would be to levy a tax on all users of quicksilver for the benefit of a small group of producers, and it is still more doubtful whether the people of the United States would submit

*An excerpt from *Bull.* 666-FF, U. S. Geological Survey.

to this tax. It has been urged that as quicksilver is essential in warfare, the mining of quicksilver should be stimulated by tariff protection. This might be an excellent argument were American quicksilver supplies without limit, but inasmuch as they are in process of exhaustion it is difficult for one who looks at the question impartially to see why the Government should hasten the approach of that day when there shall be no more quicksilver ore to mine rather than purchase quicksilver where it can be bought cheaply, store it as an immediately available reserve supply against the next war, which it is hoped may never come, and rely as a final resource upon those mines in which some ore, that would have been taken out under suffcient governmental encouragement, may yet remain to be of service in a great emergency.

[A further contribution to this subject, in the form of a letter to the vice-chairman of the U. S. Tariff Commission, appears in another part of this issue.—EDITOR.]

Wages and Labor Conditions in Gold Mining*

A committee appointed by the Secretary of the Interior to study the gold situation in the United States, of which Hennen Jennings was chairman, submitted its report to the Secretary on Oct. 30, 1918. The report, which will soon be printed by the Bureau of Mines, contains some interesting information bearing upon the labor situation in the gold-mining industry of the United States.

The rated production of gold in the United States in the last 25 years has not kept pace with the production of coal, iron, copper, or petroleum, or the rapid growth of bank deposits. The principal cause of this relative decline in gold production is ascribed by the committee as being due to the shortage of labor. Other causes are mentioned, such as the lower efficiency of available labor, the great increase in the cost of supplies, and the higher cost of power. Depletion of certain ore deposits and the lower grade of ore mined in others have also been factors. It was reported that large gold mines in California were under operation with a supply of labor from 10 to 40% lower than the normal number employed. In the Cripple Creek district, Colorado, one of the larger companies was running at 54% of its minimum requirements for maintaining normal production and development. The number of persons employed in gold mining in the gold-producing states in 1916 was 42,942; this had declined to 34,277 in 1917.

Estimates by producers regarding the efficiency of present-day labor in the gold mines are to the effect that labor is 10 to 50% less efficient than under former conditions. These are rough approximations and no data are presented to show the present per-man per-day production as compared with that in the past.

One of the principal causes for the waning supply of labor in gold mining has been that of increasing wages in the face of a uniform price for gold, which is fixed by law. The report presents an interesting comparative tabulation of miners' wages as received in certain branches of the metal-mining industries where gold is produced either directly or as a byproduct. This table was prepared by an engineer of the California Metal Producers' Association. The wages shown are for the month of September in each of the years 1913 to 1918, inclusive.

The committee makes certain recommendations affecting the labor supply, but these were made during the period of war and have at present lost their applicability somewhat. It was recommended, for instance, that exemption from the draft and deferred classification be more generally applied to those desiring to enter the industry. The U. S. Employment Service, it was suggested, could arrange to return experienced men to the mines, and the Government could permit the return of drafted men on furlough to work at gold mines, or might detail sufficient numbers of the men from selective-draft reserves for the same work. The committee in conclusion recommends a thorough study of the mining industry with a view to improving mining conditions.

RATES OF WAGES PER DAY IN CERTAIN BRANCHES OF METAL MINING WHERE GOLD IS A PRODUCT OR BYPRODUCT, SEPTEMBER, 1913 TO 1918

	September, 1913			September, 1914			September, 1915			September, 1916			September, 1917			September, 1918		
	Machine Men	Hand Miners	Muckers	Machine Men	Hand Miners	Muckers	Machine Men	Hand Miners	Muckers	Machine Men	Hand Miners	Muckers	Machine Men	Hand Miners	Muckers	Machine Men	Hand Miners	Muckers
Copper mining:																		
Montana (Butte district)	$3.70	.....	$3.70	$3.50	.....	$3.50	$3.83	.....	$3.83	$4.42	.....	$4.42	$5.00	.....	$5.00	5.25 5.75	.....	$5.25 5.75
Arizona:																		
Bisbee, Phelps Dodge Corporation	4.00	.....	3.75	4.00	.....	3.75	4.10	.....	3.85	5.32	.....	5.07	5.60	.....	5.35	5.50	.....	5.25
Verde	3.75	$3.50	3.00	3.50 3.75	$3.25 3.50	2.75 3.00	3.50 4.00	$3.25 3.75	2.75 3.25	4.00 5.00	$3.75 4.50	3.25 4.25	5.00 5.50	$4.25 5.50	4.25 5.50	$5.15 5.90	$5.15 5.90	5.15 5.90
Utah:																		
Bingham-Utah Copper Co	3.25	2.75 3.00	2.75	3.25	2.75 3.00	2.75	3.50	3.00 3.25	3.00	3.75 4.25	3.25 3.75	3.25 3.75	4.50	4.00 4.25	4.00	4.75 5.25	4.50 5.00	4.25 4.75
General average	3.25	3.00 3.25	3.00	3.25	3.00 3.25	3.00	3.25	3.00 3.25	3.00	3.25 3.75	3.00 3.75	3.00 3.50	4.50	4.25	4.00	4.75 5.25	5.00	4.75
Nevada (Ely district)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5.25	.....	.....	5.75	.....	.....
California (all districts)	3.25	.....	2.50	3.25	.....	2.50	3.25	.....	2.50	3.25 3.75	3.00 3.25	2.50 3.00	3.75 4.00	.....	3.50	4.00 4.50	3.75 4.25	3.50 4.00
Copper and gold mining:																		
Washington	3.50	3.50	3.00	3.50	3.50	3.00	3.50	3.50	3.00	3.50	3.50	3.00	4.00	4.00	3.50	5.00	5.00	4.50
Silver and gold mining:																		
Nevada:																		
Tonopah	4.50	4.50	4.00	4.50	4.50	4.00	4.50	4.50	4.00	4.50	4.50	4.00	5.00	5.00	4.50	5.50	5.50	5.00
Comstock	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	5.00	5.00	5.00
Gold mining:																		
Nevada (Goldfield)	4.00	4.00	3.75	4.00	4.00	3.75	4.00	4.00	3.75	4.00	4.00	3.75	4.00	4.00	3.75	4.00	4.00	3.75
Montana (Kendall, Barnes, King Development Co.	3.50	.....	3.50	3.50	.....	3.50	3.50	.....	3.50	3.50	.....	3.05	3.50 4.00	.....	3.50 4.00	4.00 4.50	.....	4.00 4.50
alifornia (Mother Lode and grass Valley)	2.75 3.00	.....	2.25 2.50	2.75 3.00	.....	2.25 2.50	2.75 3.00	.....	2.50	3.00 3.25	.....	2.50 2.75	3.25 3.50	.....	2.75 3.00	3.50 4.00	.....	3.00 3.50

*Extracted from *Monthly Labor Review*, April, 1919.

The Exportation of Gold From Brazil, states a consular report, was prohibited in 1917, and the output of the two large gold mines under British control, which formerly went to England (and in 1916 to the United States when that country was sending large supplies of war material to the Allies), has since remained in Brazil. The average annual export of gold metal amounted to approximately four tons.

The American Quicksilver Industry

THE following correspondence between Murray Innes, of San Francisco, and Thomas Walker Page, vice-chairman of the U. S. Tariff Commission, and between Fletcher Hamilton, the State Mineralogist of California, and the Secretary of the Interior, will be read with interest, and will serve to draw attention to the need for prompt action if the American quicksilver industry is to be saved from collapse:

San Francisco, Calif.,
Apr. 24, 1919.

Mr. Thomas Walker Page,
Vice-Chairman, U. S. Tariff Commission,
Washington, D. C.

Dear Sir:

I have your favor of Mar. 6, inclosing copy of the second annual report of the U. S. Tariff Commission, regarding quicksilver, which is by far the most valuable and complete report published to date. You were kind enough to conclude your letter as follows:

> "May we ask you to give us the benefit of any suggestions which may occur to you for its improvement. Do not hesitate to revise the statement for our consideration in any way you think advisable."

In reply I beg to state that your report shows such a thorough grasp of the matter that I would not burden you with correspondence were it not for the wider circulation just given to what practically amounts to an epitaph of the quicksilver industry in the United States, by Prof. F. L. Ransome, which concludes as follows:

> "It has been urged that as quicksilver is essential in warfare the mining of quicksilver should be stimulated by tariff protection. This might be an excellent argument were our quicksilver supplies without limit, but, inasmuch as they are in process of exhaustion, it is difficult for one who looks at the question impartially to see why the Government should hasten the approach of that day when there shall be no more quicksilver ore to mine, rather than purchase quicksilver where it can be bought cheaply, store it as an immediately available reserve supply against the next war, *which it is hoped may never come*, and rely as a final resource upon those mines in which some ore, that would have been taken out under sufficient governmental encouragement, may yet remain to be of service in a great emergency."

Accustomed as we have become to the epidemic of internationalism at Washington, the above by Professor Ransome is most discouraging to the quicksilver miners on the Pacific Coast, who for two years were urged by letters and by pamphlets and by personal appeal by Government agents to devote their very best efforts, and such funds as they had, to the development of quicksilver mines. That they made good is proved by the Government figures as follows:

	Flasks
U. S. production in 1914	16,548
U. S. production in 1917	36,159
California production in 1914	11,303
California production in 1917	23,938

The world's production of quicksilver in 1917 is estimated by Ransome at 122,592 flasks, of which the *United States produced 36,159 flasks;* Italy, 29,300 flasks; Spain, 25,133 flasks, and Austria-Hungary probably about 27,500 flasks. You will note that the United States made the largest production of all the countries in the world. It made practically the same production the following year; and aside from the question of a square deal for a couple of dozen quicksilver miners who invested from a few thousand to $200,000 in their efforts, these figures seem to prove that the production of quicksilver in the United States is a fairly effective industry.

The second annual report of the United States Tariff Commission for 1918 includes the following:

> "Quicksilver is an essential metal, however, of vital necessity in the conduct of war and widely used in the industries. It is stated that American resources, although low grade, can furnish an adequate supply for many years if a stable and sufficient price be guaranteed. Without tariff protection, the United States will be dependent in large part on outside sources for a vital commodity, and a grave question of national expediency is involved."

It is true that, due to imports from Mexico, over-production, and small demand since the armistice was signed, 21 out of 25 Western producers have been forced to shut down their mines; but the surplus stocks of metal are now well absorbed, and as production is now below our normal peacetime requirements, we had hoped to reopen some of our mines this summer. Like all other mines in this country, we are facing very high costs; and, in view of such discouragement from Washington, it might, indeed, be wise for the U. S. Government and other consumers to look outside of their own country from now on for further supplies of quicksilver, which Professor Ransome states "can be bought cheaply." This may be true for a time, but I do not think it will hold good after our home competition has been destroyed.

On this point, and in contrast to Professor Ransome's free-trade and world-embracing views, the following from a letter recently received from London sheds some light:

> "With reference to quicksilver, and in reply, beg to inform you that your information was correct. Messrs. Rothschilds control both Italy's and Spain's output of quicksilver. As to export free on board steamer at some Italian port, I have made full inquiry and have found that all quicksilver has got to pass through the London market, and there is none offered f.o.b. Italian port first."

In other words, the Rothschilds now control the entire world's supply outside the United States, and once peace is officially declared they will doubtless take great pleasure in quietly assisting Professor Ransome in putting us all out of business. When we are all down and out, our skilled men scattered and our mines caved in, we can safely leave it to the Rothschilds to make the U. S. Government and our other consumers pay a tax compared to which a fair protective tariff may seem a trifle. We frankly admit that we cannot compete on an even basis with the peon and convict and other cheap labor of Mexico, Spain, Austria and Italy; and unless we receive such protection as will keep us alive until conditions are normal, Professor Ransome's epitaph holds good.

United States consumers of quicksilver may soon find themselves paying for this destructive attitude at Washington, and, if so, they can thank Professor Ransome, of the U. S. Geological Survey, an organization that, according to the American Mining Congress, has outlived its usefulness and should now be absorbed by the U. S. Bureau of Mines.

In 1917, when the professor's approach was widely heralded on this coast, quicksilver miners hoped for some useful geological assistance, or perhaps some advice about their ore occurrence, but, to their regret, Ransome merely skedaddled over the hills as silent as a sphinx, and all we now get from his Western tour is his usual dish of statistics and his private opinions on free trade. He practically states that our efforts and our undertakings were a mistake—that we are a squeezed lemon, and that the United States has small use for us from now on.

I will ask you to contrast this essay by Professor Ransome with the following extract from the New York *Engineering and Mining Journal* of Apr. 19:

> "War conditions and post-war conditions have caused cessation of operations at many small mines and prospects. This is serious, because many of the great mines of the future must grow from the small mines and prospects of the present. Individual initiative and enterprise have made America what it is today, and

the cultivation of these traits has, in 150 years, made us what we are. The suppression of them for centuries has made Russia what she is. If reconstruction is necessary in the mineral industry, it is not from the top to the the bottom, but from the foundation upward. The top is in a fair way to take care of itself.

"Renewed and substantial encouragement for the small operators may not sound like an important post-war problem, but it is the foundation upon which must stand one of the columns of our national structure of the future. Its neglect will mean one weak member that may weaken or wreck the whole edifice."

As confirming the conditions on this coast, I enclose herewith a copy of a letter regarding the quicksilver situation, addressed to Secretary of the Interior Lane by the California State Mineralogist, Mr. Fletcher Hamilton, on Feb. 15.

Thanking you for your consideration, I am,

Yours respectfully,

(*Signed*) MURRAY INNES.

Mr. Hamilton's letter follows:

Feb. 15, 1919.

Hon. Franklin K. Lane,
Secretary of the Interior,
Washington, D. C.

Dear Sir:

I consider it my duty to call your attention the present condition of an industry that is in danger of being killed in this country. I refer to the mining of quicksilver, which, as you doubtless know, was of first importance in California a generation ago, but which had declined for various economic reasons prior to the outbreak of the European war in 1914. Due to the stimulus of war prices, the quicksilver mines in this country were able to double their output and supply practically the war requirements of the nation until the armistice was signed. Previous to November, 1918, there was, however, some apprehension at Washington that the domestic production would not be sufficient for the nation, and producers were requested by the War Industries Board to hold their stocks for Government use and not to contract ahead for other purposes.

As in all other branches of mining, costs of production and operations were about doubled during the war, and now that the demand for the metal is extremely limited there is very small sale in this country, and most of the mines on this coast have been forced to shut down. I believe there are but four producing mines still in operation in California, and the production in Oregon, Nevada and Arizona has practically ceased. The production in the State of Texas has been about cut in two, and, as a result, the present output of quicksilver is small indeed. The worst feature is that there is no sale at present for even this small output, owing to the increasing importation of Mexican quicksilver, which is produced with the aid of peon labor and which, during the last three months, has been imported into New York by steamer and also across the Texas border to the extent of from 300 to 500 flasks monthly.

Faced as they are with extremely high costs and war taxation, the American producers are entirely unable to compete with this product from Mexico. They feel that, having developed and equipped their properties at high cost, and having heeded the request of the War Industries Board to hold their metal for Government use, they are now entitled to some small preference over the Mexican mine owners, most if not all of whom are known to be aliens. American producers feel that the matter could be handled by the licensing of imports, thus giving them first call in supplying the small market which now exists for their product, until such time as normal conditions and costs prevail.

This matter appears of some importance to me, not only as a matter of justice to the quicksilver producers, but because of the fact that no quicksilver is produced in France nor in the entire British Empire, and, if our industry is entirely killed, it would not only add just a little more to the condition of unemployment in California and the West, but might at some future time leave this nation without an adequate supply of an essential war material.

The small Mexican mines above referred to are sufficient at this time to render domestic business unprofitable, but they do not promise adequate supply for future requirements.

The British Empire, has I believe, made every effort to develop quicksilver in its own dominions, but without success, and it would seem most unwise to permit our own industry to die when slight assistance at this time may save it. This matter is of an urgent nature, and I feel that your assistance in this regard is vital.

Thanking you for your consideration, I am,

Yours very respectfully,

(*Signed*) FLETCHER HAMILTON,
State Mineralogist.

Michigan Copper Mines

HOUGHTON CORRESPONDENCE

The exodus of workingmen from the Michigan copper district continues. Never in the history of this district has there been such a general departure of high-class mining men. Drastic as is the cut of 2000 men from the forces of the Calumet & Hecla subsidiaries, the men who are remaining on the job are pleased, for, under the new plan, they work full time and are able to make living wages, instead of on the former three-fourths basis, at a reduction from war wages.

The mines of the Copper Range, Baltic, Trimountain, and Champion are continuing operations. It is rumored that the Trimountain will suspend, but this is not confirmed, and at present all properties are working, although the production has been curtailed substantially from normal. Quincy continues to operate, but the management there asserts that it is producing approximately 65% of normal, and that it is not adding to its underground working forces. Production for April was 1,450,000 lb., which amount will not be exceeded for May. Last year, Quincy produced 19,948,965 lb. Mohawk production now is at the rate of 9,000,000 lb. a year, a falling off of 20% from normal and a slight falling off from 1918. These independent producers are losing some men, but have taken no such drastic action for curtailment of copper output as have Calumet & Hecla and subsidiaries.

Calumet & Hecla production for May will be under 8,000,000 lb. for the old mine and all subsidiaries. Production for June will be cut down to about 6,000,000 lb. This compares with an actual output of approximately 10,000,000 lb. for March, 1919, and a normal output of 13,000,000 pounds.

Though the total number of men let out is 2000, the underground working forces have been cut by only 900 men. This does not mean, however, that the underground forces will be taking out copper, for the specific order has gone forth that all underground men are to be put at new openings wherever possible.

Ahmeek production will be cut to 1,200,000 lb. for May and under 1,000,000 for June. Allouez will be curtailed to 300,000 lb. Calumet & Hecla proper will be cut down to 3,200,000 lb. Centennial's output will be practically nothing by June. The same is true at La Salle, Superior, and White Pine, which latter property will be closed down altogether. Osceola Consolidated will be curtailed to 700,000 lb. Isle Royale will be cut down to 700,000 lb. by June. These figures will not be reached in the month of May, but the slump will be appreciable.

Ore Dressing and Metallurgy

Provision to insure safety usually results in improved efficiency. The type of hook shown has obviated danger and saved time in one plant, and would doubtless be equally applicable elsewhere.

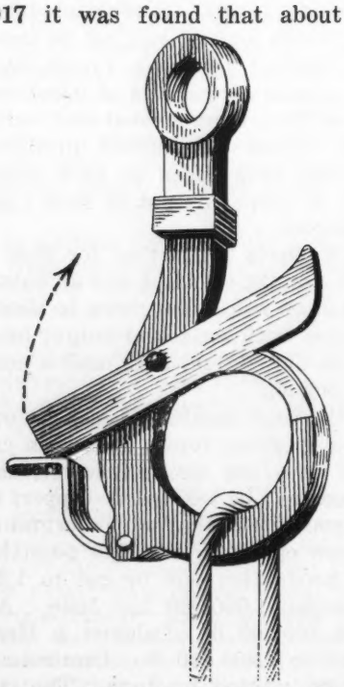
Few data have been published on the important factor of hydrometallurgical plant launder lining. The notes following show that concrete has proved a suitable material for the purpose. The lining described consists of flat slabs or U-shaped blocks. The use of magnesia cement permits repairs to be effected so that the launder is placed in operation expeditiously.

The turbo blower described is one of the noteworthy features of the new nickel refinery at Port Colborne, Ontario, Canada. Its compactness and high speed are unusual; continuous and satisfactory service has proved the soundness of design and construction.

Improved Safety Hook

A novel type of safety hook designed by J. Carroll, of the Tacoma plant of the American Smelting and Refining Co., and described by F. E. Pratt in that company's *Safety Review*, November, 1918, p. 2, is illustrated herewith.

During 1917 it was found that about once every



SAFETY HOOK THAT PREVENTS ACCIDENTS

three months an ore tub, while being lowered into a steamer's hold, would catch on the hatch combing. The cable hook would be released, and the tub and its contents would fall into the hold, sometimes injuring one or more men. The type of hook illustrated is simple and safe and has proved its reliability. In fact, its simplicity is such that no description of its operation is required.

Concrete Launder Linings*

At the Consolidated Main Reef plant at Johannesburg, South Africa, a concrete liner introduced by J. T. Walker has replaced all others for some years. At first concrete U-cross-section blocks were placed in the mill launders. For a period of three years only the lining on the bends has been replaced. The wider portions of the launder taking pulp from mill pumps to tube-mill cones (slope 9½%) were lined, bottoms and sides, with 2½-in. thick flat concrete slabs and the narrower parts with U-shaped blocks.

LIFE OF CONCRETE LINING FOR LAUNDERS

Description	Slope of Launders, Per Cent	Screen Gradings of Pulp +60	+90	−90	Life to Date
Mill launders (U-blocks)	7½	53.55	11.38	35.07	3 years +
Wide launders conveying pulp from pump discharge to tube-mill cones (slabs)	9½	53.55	11.38	35.07	3 years +
Wide launders conveying pulp from pump discharge to tube-mill cones (U-blocks)	9½	.....	.....	.....	.....
Overflow launders from tube-mill diaphragm cones (U-blocks)	18	9.6	22.4	68.0	2½ years
Overflow launders from tube mill diaphragm cones (bends)	18	9.6	22.4	68.0	4 months
Launders leaving amalgamation tables (plate house) (U-blocks)	6	14.2	34.4	51.4	4 years +
Return classifier cones to mill pulp elevating pumps (U-blocks)	8½	56.8	26.8	16.4	2½ years +
Launder under return classifier cone discharge (U-blocks)	10	56.8	26.8	16.4	5 months

Note—The + sign has been used to denote a longer life than that recorded, the liner still being in good condition at the time.

It has been necessary to renew few slabs or blocks in the last three years. Plate-house launders (slope 6%) lining of U-shaped blocks show little wear after four years' service. The U-blocks in the launder conveying the return pulp (slope 8½%) have given 2½ years of service, with promise of many additional years of life. At the head of this launder, where the classifier underflows impinge on the lining, the U-blocks last only five months. The following mixture is used for this concrete liner:

One part (by volume) dump waste (mostly quartzite) crushed to ½ inch.

One part (by volume) fine from above crushing (passing ¼ mesh).

One part (by volume) washed drift sand.

One part (by volume) Pretoria portland cement.

The blocks are cast in a long frame holding 10 to 12 molds. After allowing to set and dry for two days in the frame, they are submerged in water for six or seven days and are then ready for use.

The flat slabs are usually 2½ in. thick, with length and width to suit requirement. The blocks or section of U-cross-section are usually 18 in. long and 9 in. deep and from 11½ in. to 13½ in. wide over-all. The thickness

*Abstract from notes by F. Wartenweiler in the November issue of the *Journal* of the Chem., Met. and Min. Soc. of S. Africa.

at the bottom is from 2 in. to 2¼ in., tapering off to 1 in. sides at the top. Blocks to fit bends in the launder are made with the same cross-section dimensions. The average weight of an 18-in. length section is 75 pounds.

The slabs and U-blocks are jointed in the launders with quick-setting magnesia cement, or with mill blanketing. Either method is satisfactory. When making renewals, the worn blocks are chipped out and replaced by new ones. The discarded blocks are ground in the tube mills and pass into the pulp circuit.

Improved Turbo-Blower Unit

BY W. L. WOTHERSPOON*

The turbo blower shown in the illustrations is a part of the mechanical equipment of the International Nickel Co.'s new plant at Port Colborne, Ontario, Canada.

The unit, which was furnished by the Rateau-Battu-Smoot Company, New York, has a capacity of 15,000 cu.ft. of free air per min., delivered at 15 lb. gage pressure. The speed of 8500 r.p.m. at which it operates is believed to be the highest attempted or attained for a machine of this capacity and type. The outside dimensions of the turbo blower are 9 ft. 6 in. long, 5 ft. 0 in. wide, and 3 ft. 11 in. high from floor line.

As will be seen from Fig. 1, the driving end of the unit consists of a three-stage steam turbine in which the wheels are forged integral with the shaft. The turbine is designed to operate on steam at 150 lb. pressure, superheat 100° F., and exhaust 2 in. of mercury absolute, under which conditions it can develop a maximum of 700 h.p. The turbine and blower shafts are connected by means of a flexible-pin type coupling. An important feature is the design of the blower impellers.

The equipment contains many special features, illustrating an advanced stage of turbo-blower design in both steam and air ends. In view of the high speed to be maintained, special attention was given to the question of exact dynamic balancing and efficient lubrication. Some repairs were found necessary at the beginning of operations, as a result of fracture of the impeller blades in the blower, due to faulty steel; but the adoption of nickel steel for these parts obviated further trouble.

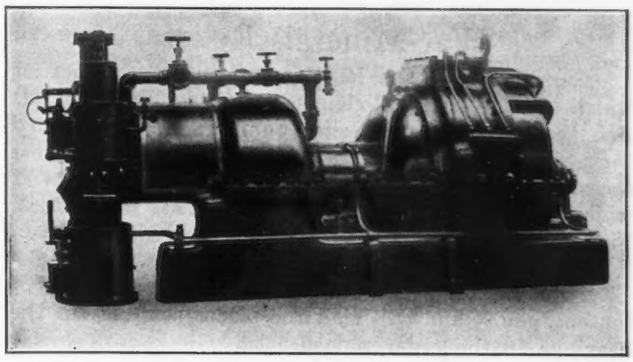


FIG. 2. THE TURBO-BLOWER UNIT AT THE INTERNATIONAL NICKEL CO.'S PLANT AT PORT COLBORNE

The unit is equipped with a sensitive, constant-pressure regulator; and, as the compressed air delivered is for use in copper converters, a stabilizer has been added to permit the blower to run without tendency to surge on all loads from zero to maximum. A safety device to prevent over-speeding is also provided. This consists of a small fan on the end of the turbine shaft, which maintains a definite pressure on a tripping device controlling a butterfly valve in the steam line. This tripping device is capable of operating practically an unlimited number of times on these high-speed machines without liability to damage to the movable parts.

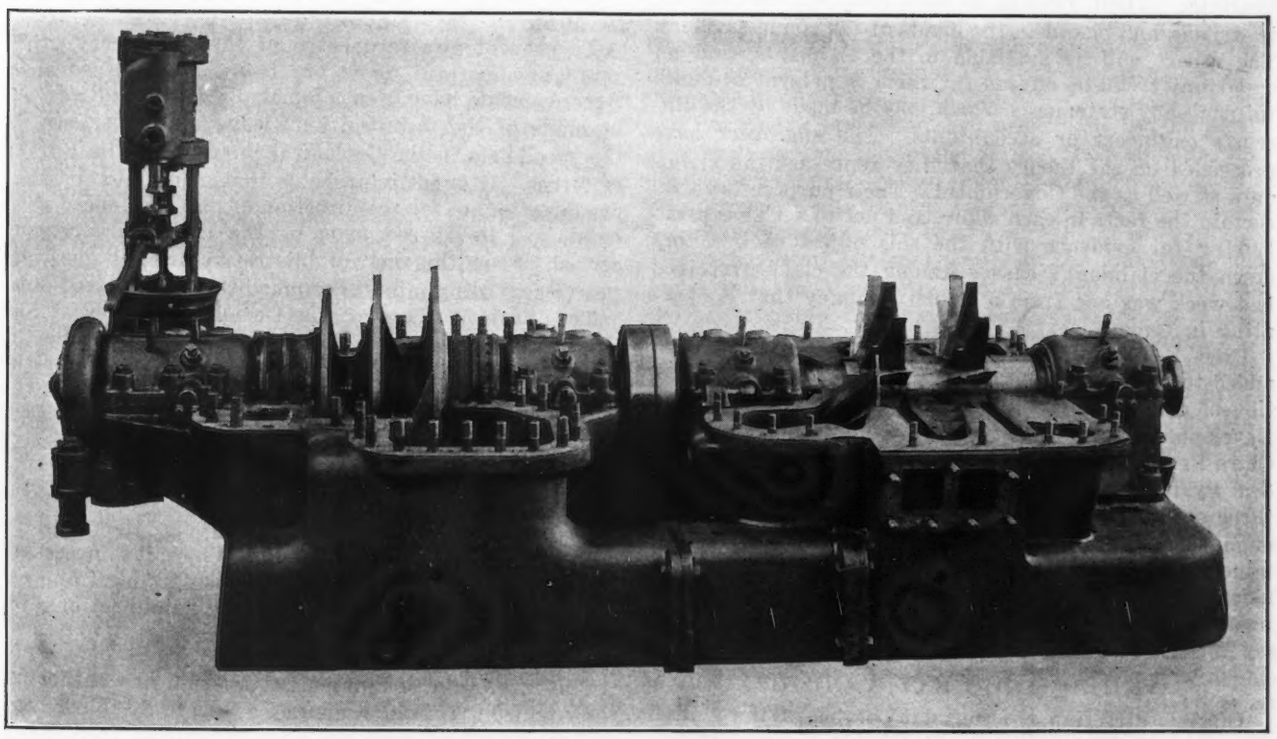


FIG. 1. HIGH-SPEED TURBO BLOWER DISMANTLED FOR INSPECTION

*Consulting engineer, International Nickel Co., 43 Exchange Place, New York.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

War-Minerals Relief

After analyzing the locations of mining properties which are the bases of claims under the War-Minerals Act, the War-Minerals Relief Commission has selected for hearings certain central points which will be most accessible to the majority of claimants. The points at which hearings will be held are as follows: Little Rock, Tucson, Los Angeles, San Francisco, Medford, Ore.; Portland, Ore.; Baker, Ore.; Spokane, Butte, Salt Lake City, and Denver. The commission will leave Washington on June 7, and will visit the places selected for the hearings in the order named.

As it is the intention to give each claimant an opportunity to appear in person, or to be represented by an attorney, it is impossible to arrange the dates of the hearings far in advance. Several days' advance notice will be given, however. The hearings, wherever possible, will be conducted in the post office or other Federal building. After the return of the commission to Washington, it is possible that it may visit Atlanta.

The engineers and accountants of the Bureau of Mines who have made examinations in connection with the claims will not be put upon the stand during the hearings. Their reports in each case will be reduced to writing and placed in the hands of the commissioners. The report will be available to the claimants, and an opportunity will be offered for them to present evidence refuting any statements which may be made by the Bureau's engineers or accountants. The engineers have proceeded on the theory that they represent the claimants as well as the Government. Their purpose is to ascertain the facts in each claim, and not to act as experts looking for evidence with the sole object of breaking down the claimant's case. Among the claims received last week was one from a Cuban company that is operating in Cuba.

Fred P. Williams and J. A. Battle, Jr., have been added to the staff of engineers engaged in the examination of claims. Mr. Williams comes from the Fomento Development Co., which has been operating in Santa Clara Province, in Cuba, and Mr. Battle from the Northern Pyrites Co., operating in Ontario. In addition, three engineers familiar with chrome mining are to be engaged. The commission is finding that competent mine accountants are scarce, and is experiencing considerable difficulty in securing the services of enough men to meet its needs.

Mining-Engineer Consuls

Officials directing the consular service of the United States invite mining engineers, and others with a knowledge of the business side of mining, to take the consular examination, with the view to being sent to consular posts in regions where mining is the most important industry.

At present, there are few men in the consular service who pretend to be specialists in mining. It is pointed out that the only way in which the consular service could designate such men would be to have men thus qualified take the examination. The salaries paid to consuls are so small that few, if any, mining engineers are attracted to the work. It is suggested, however, that the service should appeal to older mining engineers with means. To such men, the salary would be a secondary consideration, and an excellent opportunity would be afforded them to be of great service to the mining industry.

American consuls abroad usually enjoy prestige and pleasant social relationships. Consular officials see no reason why the places would not appeal to retired mining men, and they would be glad to do all in their power to place these men where their experience would increase their efficiency, provided they can be induced to take the examination prescribed by law. The examination is not a difficult one.

Mineral Industry Census

Approximately $500,000 will be expended during the taking of the coming census in the collection of data concerning the mineral industries. The handling of the information pertaining to mines and quarries at the last census gave rise to considerable criticism. It is admitted in official circles that much of the criticism was justified.

To prevent any recurrence of the inefficiency of 10 years ago, careful plans are being made in advance. Arrangements have been completed whereby full use will be made of the technical knowledge and experience of the specialists in the Geological Survey and the Bureau of Mines. It is not improbable that a special statistical organization, under the direction of an experienced geologist, will be agreed upon by the three bureaus concerned. From this one administrative unit, all questionnaires regarding mineral commodities will be sent out.

The Western offices of the Geological Survey at San Francisco, Denver, and Salt Lake City will handle the mining schedule for the Western mining states for the Bureau in making the census. For the period of the census, practically the entire clerical and technical staff of the Minerals Resources Division of the Survey will be sworn in as census agents.

Ten years ago, the mineral returns were gathered principally by field agents. This year they will be gathered almost entirely by mail. Where it is necessary to use field agents, they will be chosen from mining engineers or others who have special qualifications for the intelligent handling of mineral data.

The Interstate Commerce Commission has authorized the Atchison, Topeka & Santa Fé R.R. to establish rates on ore dependent upon value, on shipments from Santa Rita, Fierro, Hanover, and Silver City to Waldo, N. M.

Exports of mining machinery in March, 1919, were valued at $947,898. This compares with $1,286,616, the value of such exports in March, 1918. In addition to the foregoing figures, oil-well machinery to the value of $414,589 was exported in March, 1919. This compares with $123,572 in March, 1918.

Mining and Geological Exposition

WASHINGTON CORRESPONDENCE

An exposition of unusual attractiveness will be held in the building of the Department of the Interior, in Washington, for the two weeks beginning May 19. It is intended to draw attention to, among other things, the war and reconstruction work of the bureaus of the department. It will show how a non-military agency of the Government developed super-poisonous gases. Devices will be exhibited which were used to detect the presence of the enemy underground, and exhibits will demonstrate how the mining industry furnished greatly needed war minerals. Exhibits will show how the airplane is being considered as an important adjunct in topographic work. There will be a display of devices that helped to win the war, and the work of each bureau in the department will be outlined.

There are to be lecture and moving-picture programs three times daily, and arrangements have been made for the attendance of classes in schools and colleges.

The Bureau of Mines will present an exhibit showing the sources of war minerals and the preparation and the utilization of these minerals for military purposes and for use in essential industries. One feature of this display will be the history of the shrapnel shell. The copper, zinc, lead, antimony, mercury, nitrate, pyrite, sulphur, and other component materials will be shown in each state of processing.

Much attention is to be given to American graphite and clays at the exposition, and their use in the manufacture of crucibles will be demonstrated. The many varieties of American clays will be displayed in the raw material and in the finished products. Another exhibit will show the development of the iron and steel industry, especially along the lines of special steels used in military equipment. The use of manganese, chrome, tungsten, and other ferro-alloys also will be depicted. The history and world control of potash, tin, nickel, asbestos, magnesite, and mica will be shown in an attractive manner.

The Petroleum Division of the Bureau of Mines will have as its part of the exhibit given by the Department of the Interior the following features:

A miniature drilling rig, showing how an oil well is put down; a model which will illustrate the principle of making gasoline from natural gas; a model showing how gasoline is made from crude oil in the refineries; actual joints of pipe that go into the oil well. The field method that is used for separating free water from oil and the movement of oil through stone will be shown by working models. There will be a model illustrating the manner in which layers of stone and shale are laid down through geological ages, and how these are pierced to the oil-bearing sand.

When a well is drilled into water it is necessary to cement the lower part of the well if operations are to be continued. A model of the instrument which is used in this connection will be shown. Various graphic representations will serve to describe an oil anticline, how records of wells are kept, and a drawing will delineate the various processes through which the oil passes, from the time it leaves the well until it gets to the refinery. Numerous photographs will show the various phases of the oil industry, and there will be on exhibit samples of oil shale, crude oils, and war gasolines.

That the war has made some fundamental changes in methods will be seen in the exhibit arranged by the Geological Survey. This organization is already using the airplane in making topographic maps, and expects that this branch of the work will grow rapidly. The use of the airplane has already resulted in better maps than were previously possible. All this development occurred during the war, when the airmen flew over enemy territory and photographed the country, turning their results over to the Survey men, who developed the maps. The newer methods will be illustrated at this exhibit.

There will also be two large models, one of which will show an undeveloped region being investigated by geologists, topographers, and engineers, and the other the same region after they have completed their work and shown the natural resources and the possible development of the territory. The so-called war minerals, which were so badly needed for victory and which were sought eagerly all over the country, will also be displayed, conveying a unique lesson of what a thoroughly aroused nation can accomplish under stress.

Journal Copper Quotation Basis for Balaklala Suit

William A. Kerr, vice-president and general manager of the Balaklala Consolidated Copper Co., operating subsidiary of the First National Copper Co., according to the *Boston News Bureau* of May 9 has brought suit against the Mammoth Copper Mining Co. and the United States Smelting, Refining and Mining Co. for a settlement on all ores shipped during the latter part of November and the months of December and January. The amount involved approximates $40,000; the tonnage about 18,000.

Preliminary settlement had been made by the smelting company on the basis of 15c. a pound for the copper. The first quotation of the *Journal* following the shipments was 18.39c. a pound, which the Balaklala company demands shall be the actual settlement figure.

The smelting contract between the Balaklala company and the Mammoth company was for a 10-year period effective in August, 1915, and provided that the Mammoth company pay the Balaklala company for the copper content of ore shipped on the basis of the *Journal* weekly price averages. Following the armistice there was a suspension of these quotations from about Dec. 1 to Feb. 8. The first one thereafter was 18.39c. a pound.

Mines and Railroads in the Nogales District of Sonora

Of the minerals produced in the Nogales district of Sonora, copper easily leads, both as to bulk and value, states a consular report. Exports of this metal for the year 1918 reached the total of $15,471,000, of which only $70,000 worth was shipped through the port of Nogales, the remainder being shipped through the consular agencies of Cananea and Agua Prieta. Next comes silver, with a total export value of $5,237,000. Silver ore and silver bullion are of about equal importance, with silver concentrates ranking next. The larger portion of the silver exported also goes through Cananea and Agua Prieta. Graphite ore to the value of $244,000 is included in the returns of this consulate, but it is all mined in the district of Guaymas; these shipments are

usually billed to Saginaw, Mich. Gold exports from the district for the year 1918 total $1,355,155. Among other ores shipped from this district may be mentioned tungsten, molybdenum, and antimony.

The Southern Pacific R. R. Co. of Mexico is the only line of consequence operating in Nogales. This road runs tri-weekly trains from Nogales to Guaymas, a distance of 245 miles. The same system operates a branch line running tri-weekly trains from Nogales to Naco via Cananea, a distance of 120 miles. The Nacozari R.R. runs trains from Agua Prieta to Pilares, Sonora, a distance of 65 miles. These are the only railroads in the district. The property of both these companies has greatly deteriorated, owing to the fact that they have been compelled on several occasions to withdraw all trains and practically abandon their roadbeds. All the bridges of these two railways have been destroyed; and all rolling stock, the roadbed, terminals, and buildings must be renewed at an early date if the roads are to continue to operate.

American Mining Congress in Alabama

At a meeting of producers in the Birmingham Chamber of Commerce held on May 1, the Alabama Chapter of the American Mining Congress was launched, with 50 charter members. The governor of the new chapter is T. H. Aldrich, a leading mining engineer of Alabama. The vice-governors are J. B. McClary, president of the Yolande Coal Co.; A. B. Conklin, president of the Clay County Graphite Co., and Eugene Fies, president of the National Pyrites and Copper Co. Other directors are Leo K. Steiner, president of the Liberty Graphite Co.; C. T. Fairbairn, general manager of the Republic Iron and Steel Co.; Theodore Swann, president of the Southern Manganese Corporation; Floyd Weed, of the Ceylon Co. (graphite), and L. Sevier, of the Sloss-Sheffield Steel and Iron Co. John N. Vincent, assistant secretary of the Alabama Coal Operators' Association, is secretary of the chapter. A membership committee, now at work, is determined to bring the membership up to 100. There will be close affiliation with the Alabama Coal Association, of which all of the coal producers of the chapter are members.

Dredging Operations in Colorado

The Derry Ranch Gold Dredging Co., of Leadville, Colo., resumed dredging operations on Apr. 20, after having been closed down, as usual, during the winter months. This dredge is situated a few miles from Leadville, at an altitude of about 10,000 ft., and the winter climate is so severe that it is to the advantage of the company to suspend operations during the cold season. The company is generally fortunate enough to secure the return of its regular dredging crew each spring, which undoubtedly contributes largely to the successful results achieved.

Operations were begun over three years ago, on a piece of ground that had been previously under consideration by many other companies, but all had hesitated to undertake the equipment of the property with a dredge. The gold recoveries were high, but boulders were large and numerous, and some of the gravel was tightly cemented. It remained for the present company to equip the property with a modern dredge, which has proved highly efficient since it began operations.

Foreign Trade in Metals and Ores

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for March, 1919, and the figures for March, 1918, as finally revised, are as follows:

IMPORTS, MARCH, 1918 AND 1919

(In pounds, unless otherwise stated)

Metal and Ore	March, 1918	March, 1919
Antimony ore, contents	234,356	90,726
Antimony matte, regulus or metal	3,048,752	1,233,904
Copper:		
Ore, contents	11,068,341	4,475,752
Concentrates, contents	3,724,800	2,229,506
Matte, regulus, etc., contents	3,599,160	3,441,721
Imported from (in part):		
Canada	2,703,945	1,723,017
Mexico	7,717,524	2,368,702
Cuba	5,740,547	925,295
Chile	516,916	4,903,436
Peru	40,939	127,037
Venezuela	166,033	*Nil*
Unrefined, black, blister, etc	36,514,548	49,564,536
Refined, in bars, plates, etc	*Nil*	1,678,919
Old, etc., for remanufacture	36,400	400,240
Composition metal, copper chief value	*Nil*	10,235
Lead:		
Ore, contents	6,903,016	1,512,494
Bullion contents	14,340,440	7,937,167
Imported from (in part):		
Canada	2,084,554	1,329,994
Mexico	15,418,852	8,101,265
Pigs, bars and old	1,061,004	623,525
Pyrites, long tons	51,276	12,959
Imported from (in part):		
Spain, long tons	49,566	10,944
Canada, long tons	1,540	1,765
Tin ore, long tons	613	1,066
Tin bars, blocks, pigs, etc	13,529,209	8,284,970
Imported from (in part):		
Straits Settlements	6,801,623	7,930,972
Dutch East Indies	375,905	*Nil*
United Kingdom	3,344,557	*Nil*
Australia	379,572	71,680
Hong Kong	1,709,001	*Nil*
Tungsten ore, long tons	284	675
Manganese ore, long tons	19,300	48,238
Imported from (in part):		
Cuba, long tons	10,525	6,270
Brazil, long tons	6,907	37,935
British India, long tons	500	*Nil*
Zinc:		
Ore, contents	4,801,336	1,814,142
Imported from:		
Canada	992,380	358,605
Mexico	3,808,956	1,455,537
Blocks, or pigs, and old	4,371	*Nil*

EXPORTS OF LEAD, COPPER AND ZINC

(In pounds)

	March, 1918	March, 1919
Copper:		
Ore, contents	270,175	1,600
Concentrates, contents	111,220	*Nil*
Unrefined, black, blister, etc	4,291,367	269,343
Refined, in ingots, bars, etc	59,776,855	13,088,819
Exported to (in part):		
France	38,980,549	1,214,152
Italy	9,068,568	3,540,891
United Kingdom	9,830,999	2,359,896
Canada	1,452,148	920,588
Composition metal, copper chief value	42,660	85,015
Old and scrap	64,900	219,036
Pipes and tubes	449,197	665,219
Plates and sheets	2,729,851	853,543
Wire, except insulated	918,037	12,039,554
Lead:		
Pigs, bars, etc., produced from domestic ore	16,363,220	4,289,414
Pigs, bars, etc., produced from foreign ore	1,998,566	2,635,524
Exported to (in part):		
Denmark	*Nil*	422,179
Canada	2,018,279	695,378
United Kingdom	12,714,785	3,846,563
Argentina	82,880	426,200
Japan	1,803,349	*Nil*
France	*Nil*	1,141,205
Brazil	582,269	172,000
Zinc:		
Dross	1,279,807	220,984
Spelter:		
Produced from domestic ore	12,875,317	14,373,192
Produced from foreign ore	4,072,900	1,786,277
Exported to (in part):		
France	9,274,701	2,657,112
Italy	726,041	3,911,936
United Kingdom	5,401,694	8,130,264
Canada	1,110,611	593,650
Mexico	244,470	*Nil*
Japan	*Nil*	112,000
In sheets, strips, etc	1,831,980	5,368,115

Vancouver Manganese Deposits in the Cowichan district will be discussed and all available information relating thereto will be included in a publication to be issued soon by the Canadian Munition Resources Commission, according to G. C. Mackenzie, late of the Canadian Geological Survey Branch, Ottawa

Bonus Systems in Montana Mines

BUTTE CORRESPONDENCE

Increased efficiency measures are commanding much attention from the officials of the Anaconda Copper Mining Co., which recently has put into effect a contract system for the miners employed in stoping operations. Heretofore the contract system applied only to men engaged in driving drifts, crosscuts, or mucking, the workers in the stopes being paid only their daily wage. Men on contract usually do from 25 to 30% more work, as they are paid for the results actually accomplished, and the miner is found to be more satisfied than when his daily pay ranges around $8 or $10, despite the fact that he labors far harder than ordinarily. More is accomplished for the companies under the same overhead expense, and a marked increase in efficiency is looked for through an extension of the plan. Since the signing of the armistice, which released a floodtide of labor, enabling the mining companies to select their men, efficiency in the Butte district has been increased from 20 to 30%. The North Butte Mining Co. estimates that it has increased efficiency at its mines up to about 25%, through a bonus system introduced about a month ago, with a consequent lowering of its copper costs to 14.2c. per lb., and still further improvement is expected. The bonus is paid weekly, and is based upon actual details performed in connection with the miner's daily work, whether it be in the stopes or otherwise. At present the bonus applies only to underground workers, but it is the plan of the management to extend it to every employee of the North Butte.

The Butte & Superior Mining Co. has been experimenting with the contract pay system for a period of one month, as applied to men stoping ore, with satisfactory results, according to an unofficial statement. The percentage of improvement is found to be about the same as elsewhere in the district.

American Institute of Mining and Metallurgical Engineers

The New York Section of the American Institute of Mining and Metallurgical Engineers held its regular monthly meeting on the evening of May 7. Officers for the ensuing year were balloted for, and Allen H. Rogers, chairman, declared the following elected: Chairman, E. P. Mathewson; vice-chairmen, William Young Westervelt and R. M. Atwater, Jr.; treasurer, Wilber Judson; committeemen, E. S. Berry and L. W. Mayer.

Col. O. B. Perry, of the 27th Regiment of Engineers, was introduced and entertained the members by an interesting description of the activities of the 27th in France. Colonel Perry also described the engineering organization of an army. Capt. E. S. Berry gave a short but illuminating description of the Army Supply Service.

April Pig-Iron Production

Pig-iron production during April was 2,478,218 gross tons, or an average of 82,607 tons a day, according to *Iron Age*, a falling off of 25% from production in April, 1918. The 212 furnaces active May 1 have an estimated daily capacity of 75,860 gross tons, as compared with 266 furnaces, rated at 93,165 tons, on Apr. 1, 1919, and 350 furnaces, rated at 109,675 tons, on Jan. 1. In April, 56 furnaces, including 13 in the Pittsburgh district, were blown out; 2 were blown in. Reports show a net loss of 54 active stacks in April and 138 in the first four months of this year. Only 17,308 gross tons of ferro-alloys was made, spiegeleisen amounting to but 2778 gross tons.

New Iron-Ore Prices Effective

Lake Superior iron-ore prices have been reduced 20c. per ton, following the cut from $1 to 80c. in the net vessel rate from the ports at the head of the Lakes and a reduction at the same rate, or 20%, from other ports, according to *Iron Age* of May 1, 1919. The new prices are in conformity with the decision of the recent Washington price conference, which left late 1918 prices unchanged, but subject to any reduction in either the rail rates from the mines or vessel rates, thus giving the consumer instead of the ore shippers the benefit of any reduction in carrying charges.

The few ore contracts that have been placed up to the present were at the late 1918 prices, but had a rider which provided that the buyer would be given the benefit of any reduction in transportation charges. With the formal changing of the prices, contracts taken from now on will provide that the prices named shall be subject to any change that may be made during the season in the railroad rates or in the Government tax.

The application made by some of the railroads to increase the unloading charge from 10 to 15c. per ton at Lake Erie ports was considered at a meeting held in Pittsburgh, April 25, and refused. Consequently, ore consumers will get the full benefit of the 20c. per ton reduction in carrying charges. The new carrying charges are 80c. per ton, net, from Duluth; 72c. from Marquette and 60c. from Escanaba.

Little ore is being sold, and the outlook for business during the next few weeks is not promising. Some of the ore firms have begun shipping ore in a small way, but indications are that the movement will not get well under way before the first of June.

The iron-ore carrying capacity of the Lake fleet has been reduced 520,000 tons this year, based upon a carrying season of 20 trips. There are now 377 ore carriers, with an aggregate trip carrying capacity of 3,029,000 gross tons, as compared with 3,055,400 gross tons last year. The reduction in vessel tonnage has resulted from the requisitioning of Lake vessels for the ocean trade. New ore prices, delivered f.o.b. lower Lake ports, are as follows: Old range bessemer, $6.45; old range nonbessemer, $5.70; Mesabi bessemer, $6.20; Mesabi nonbessemer, $5.55.

Arizona Tax Commission Defeated

PHŒNIX CORRESPONDENCE

The victory of the Standard Oil Co. of California at San Francisco, on May 5, when it won its suit against the Arizona Tax Commission, is of great interest to Arizona mining men. By a decision of the U. S. Court of Appeals, a temporary injunction was granted against the Tax Commission's increase of assessed valuation for 1917. This means that the basis for the objectionable Arizona mine-tax law will be swept away.

The appellate decision upheld the company's appeal, which charged that the Tax Commission's valuation was fundamentally erroneous and unwarranted. The decision also overruled that of the Arizona district court, which upheld the increase.

Editorials

The Need of a Policy

WHEN Senator Hitchcock, of Nebraska, heard that this country was to receive potash in part payment for food exported to Germany, he sent a protest to Paris in the interest of American producers, urging that the shipment of the fertilizer be prevented. In reply, Mr. Baruch, adviser to the Peace Commission, told him that the potash industry could be defended against imports from Germany only by an act of Congress.

This brings up the question of what can or what should be done by Congress in respect to all of that group of products known as "war minerals." It is not only the producers of American potash who seek legislation that would enable them to produce and sell at a profit, but in the same class are the producers of magnesite, chromite, pyrite, manganese, tungsten, mercury, and graphite.

Are we to have free importation of these ores, are they to be shut out by high tariffs, or are we to have limited importations? The reasons for free importation or for domestic development, consumption, or conservation are so nearly identical in each case that the group might well be considered as a whole, the policy adopted for one being the policy adopted for others.

The problem is not an easy one to solve. Three important and more or less conflicting interests demand consideration. First, there is the producer, who, collectively, has many millions of dollars invested in these various "war-mineral" enterprises. It goes without saying that his capital should be protected; and, if protected, he is willing to invest further along the same lines and add to the industrial development of the country. Second, we have the manufacturer and consumer. It is obvious that the consumer should obtain his raw material at the lowest possible price, and, likewise, the manufacturer, so that his industry may thrive and grow. Third, we have the interest of all the people, the Government. We have learned that foreign supplies of any of these necessities may be unexpectedly cut off, thereby bringing about a serious situation. From the Government point of view, sources of all of these materials should be so developed that at short notice the United States would be in a position to produce all of its requirements without extraordinary effort, and at only a reasonable advance in price.

Fifty years ago the producer was the favored business man, and the development of our natural resources was the subject of greatest importance; but gradually, as the years have gone by, there has been a letting down of the tariff bars in the interest of the consumer, until in the case of manganese and chromium neither could be profitably produced in this country.

If we had only the personal interest of the producer, on the one hand, and the personal interest of the consumer, on the other, to consider, a fair and reasonable compromise might be effected. We know what it costs to produce under normal conditions; we know the effect of tariffs on imports; we have data for a reasonable compromise, which would, of course, be affected to some extent by the force with which the case of the producer or consumer was presented. The questions that are pending may reach a solution in this manner, but we cannot overlook the third factor—the interest of all the people in providing against the possibility of being deprived of the prime necessity in the event of limited domestic developments and sudden cessation of free importations.

Perhaps international relations of the future will permit each country to produce that mineral or minerals which it can produce best, with no thought of free commerce being interrupted and no emergency to be provided for. Though such an ideal condition is desirable, it will not be the part of wisdom to take for granted that it has arrived. We have been taught a lesson in preparedness. Let us remember it for a generation or two at least.

Reversion to the importation regulations existing prior to 1915 not only means the permanent closing of the mines of our uncommon ores, if we may use that term, but it will throw the Government back into exactly its same condition of unpreparedness as of that date. The sin would be greater now than it was then, for we would all know that we were unprepared. This is not an appeal for a high tariff on the ores and minerals mentioned, nor an appeal for free importation, but merely an attempt to look at the three sides of the question.

Vast amounts of money are due us from abroad. Gold cannot possibly be sent to us, and we could not use it if we could get it. Our credits can be liquidated only with raw and manufactured products from across the seas. We do not desire to close any of our factories, and our prosperity depends largely upon our debtors paying their bills. We cannot close our ports to those things that they can produce most cheaply.

Whatever the solution to this set of problems, we hope that they will not be studied and treated separately. The question of potash is only one of many. If presented alone, the producers of potash, being numerically small as compared with the consumers, may receive scant consideration. Likewise the producers of each of the other minerals, if working alone, will fail to produce the necessary impression. A constructive and sound national policy in respect to the war minerals is urgently needed; and, in making the appeal to Congress for it, it is most important to remember that "United we stand, divided we fall."

An Open Market for Steel

THE stabilization of steel prices has been abandoned, and the Government's price-stabilization program, initiated by Secretary Redfield, is at an end. The refusal of Walker D. Hines, Director-General of Railroads, to accept the steel prices fixed by the Industrial Board, was the first blow which struck the tentative plans of that body. That it was effective is now shown by the action of Secretary Redfield in accepting the resignations of the members of the Industrial Board. On top of this comes the announcement of Attorney General Palmer

that the proposed plans of the board for stabilizing industry violated the anti-trust laws and are unauthorized by law.

There is now an open market for steel, and the steel industry will have to take its chances, like any other industry. The price question seems to be now settled for a long time. It is said that the U. S. Steel Corporation will continue the prices rejected by the Railroad Administration, and it bases its stand upon the assertion that the costs of production will not permit of a cut in the present price of steel products without a reduction in the wages paid to the steel workers. However this may be, the important fact is that the steel industry is now on a competitive basis. The law of supply and demand will quickly determine the ruling prices, and permit industries dependent upon steel to resume.

Metallurgical Accounting

AN ANONYMOUS correspondent, who directs our attention to an account of the operations of the West End Consolidated Mining Co., which appeared in the Nov. 23 issue of the *Journal*, wherein "increase of tonnage milled" should have read "increase of tonnage mined" (the culpability for which we acknowledge and which we gladly correct), points out the lack of reference in the article to the extraction of the metals. Our account gave the tonnage treated, the gold and silver content in the ore milled, and the actual gold and silver recovered. These figures were taken from the annual report, and seemed to us to present the fundamental results of the year's work in a form condensed to suit the available space in our columns. It also happened that the time to make the necessary calculations, so as to be able to present other data in as complete a form as we should have wished, was not available.

Our correspondent's objection draws attention to the urgent need for a standardization of company reports, particularly with reference to metallurgical results, so that vital data would be available at first sight and verbose statistical repetitions would be avoided. We have made a detailed study of the report in question and find that, although it is clearly stated that the mill operations resulted in a total recovery of metals amounting to 12,853.93 oz. gold and 1,219,860.68 oz. silver, a closer examination shows that the figures include 2634.4 oz. of fine metal which was left in the slag, and which, by no stretch of the imagination, could be considered as having been recovered. To those who insist that such a system of accounting is logical, one would ask whether they would agree that, if slovenly work developed at a smeltery, and half the metal instead of only a minute proportion was left in the slag, the estimate of recovery would remain unaltered. The percentage of recovery should be one of the most vital indices of metallurgical efficiency, but it would be valueless in this connection if it did not represent the metal finally obtained in salable form, and that only.

Our correspondent's objection raises still another point —with regard to the statement of percentage of extraction and recovery; and in this connection a few explanatory remarks will not be amiss. On several occasions it has been pointed out that percentage extraction and recovery are no indications of the comparative efficiency of operations or the suitability of the process when unaccompanied by information as to the metal content per ton of the ore being treated. A 97% recovery from a 1000-oz. ore might leave much to be desired; a 90% recovery on a 10-oz. ore might be considered commendable. If percentage recovery figures are quoted they should be accompanied by an estimate of the weight of the metal in the ore. If this factor is not taken into consideration, the achievements at the plants of some of the low-grade copper mines would be entirely overlooked.

Again, the money value of a silver-gold ore or of the bullion produced cannot logically be stated in connection with recovery figures, because a fluctuation in the price of the silver would result in a corresponding fluctuation in estimated recovery percentage, without any change having occurred in actual metallurgical results. So the metallurgist in charge might be blamed in one case, and praised in another, for variations over which he had no control, and for which, therefore, he could not be held responsible.

By making the necessary calculations we find that the grade of the ore treated at the West End mill during 1917 was, approximately, 19.7 oz. silver and 0.203 oz. gold per ton. It is difficult to understand why these significant figures were omitted from the annual report. Such data convey a definite impression as to comparative metal content, whereas the information given—"a value of $20.51 per ton"—certainly does not.

Engineering, Latin, and Greek

AMONG the reconstruction problems confronting our colleges and universities is that of readjusting their curricula to modern needs, or to requirements that appear to have developed within recent years. Modifications of entrance requirements are being made. We read notices of first one institution and then another reducing the conditional knowledge of Latin and Greek, or eliminating both from entrance requirements. The idea seems to be popular, but we are not sure it is wise.

Latin or Greek roots have little to do with the successful erection of a bridge, the sinking of a shaft, or with the smelting of an ore. The ability to read a page of Virgil is of little assistance in developing a process for the separation of chalcopyrite from sphalerite by selective flotation. Xenophon throws no light on armatures or electro magnets. Then why worry ourselves with the dead languages? Why not put them into the discard, and study only to familiarize ourselves with the tools that are used directly in the solution of the problems of the day?

To answer these questions one must formulate in his own mind his conception of the character of an engineer: what he should know, but, more particularly, what he should be. We might possibly define the word "engineer," giving briefly a clear and concise definition of the appellation, and yet fall far short of conveying our conception of the term. In our every-day life we are likely to use some words carelessly; we speak of a politician when we may be thinking of a political boss, or it may be of a statesman—men whose characters are as opposite as the magnetic poles. So in using the word "engineer" we may use it in speaking of men whose technical training may have been carried to the extreme without any attempt to form character, or, on the other hand, men whose characters have been developed without much technical training.

If the term engineer is to be strictly interpreted, if it is to be confined to one engaged only in the solution of technical problems, one who uses the forces of nature,

the laws of mechanics and chemistry to earn money, if we have in mind only brain development for commercial purposes, then we are thinking of a character that may be completely formed without the use of Latin or Greek, without the study of history, of humanity, or even without English.

But if, on the other hand, our conception of the title pictures a man with some of these attainments, but also with real character, a man of broad and deep insight, a man equally at home with labor or with capital—their connecting link—a man capable of leading his fellow men in fields of science, commerce, or statesmanship—then we are thinking of a character of a finer sort. We are thinking of one whose education rests on principles, not on details of laboratory practice. On the one hand, we have the specialist so deep in his own particular subject that he fails to realize that there is another life more worth the living, which knows nothing of technical details. On the other hand, we have a man who would confine himself to principles, and to so many of them, that his education, like a veneer of handsome wood over a large area, would be so thin that it would stand no wear—the slightest abrasion would show the coarse-grained common lumber underneath.

In the drastic changes that have been recommended in our colleges we fear that the authorities, in their recognition of the fact that there has been a tendency to veneer the character, are jumping toward the other extreme, and are preparing to educate men solely for the purpose of making money. We hope that our colleges will, if they advance in this direction, go slowly and carefully and not sacrifice the things which go to make life enjoyable for those which lead only to remuneration and to the thoughts of greed, gain, and power.

Latin is a dead language only in so far as we do not know it. It is with us every day, in our own English, in French, Italian, and Spanish. It is with us in the laboratory, in our reagents, ores, and minerals. If we would know history and enjoy it, we must know the language that preceded ours. When we speak with those with whom it is worth while to talk, we will often find that we are talking with men who know the dead languages.

None of us knows what lies before him, and what it is best to study. We look into the future, but there is a lack of background with which to form a perspective. If we look into the past, there we have a distinct background and we can see things in their proper proportions. We cannot look far into the future, but we can look backward and reason by analogy. Did our ideal engineering characters study languages and history, or did they confine themselves to technical subjects? Did the men who really enjoy life, and whom we enjoy, study language, history, English, art and music? King, Douglas, Raymond were all technical men, but they were more—they were engineers in the sense that we may strive for, if we do not attain. These men might possibly have held that Latin was non-essential, but we cannot conceive of their being ignorant of it.

We need specialists, but we need more broad-minded engineers, capable of directing specialists—men who will be managers in every sense of the word; and to make such men we must not limit the work of our students to technology. Mortimer E. Cooley, Dean of the College of Engineering at the University of Michigan, wrote in a recent communication to the New York *Sun*, "For the young American going into engineering I would advise a thorough preparation in fundamentals, eschewing all fads, even manual training and the practical things thought so essential to his success, and including not less than two years of Latin, preferably three or four years. Considerable history, some political economy. A good knowledge of English and of literature. A speaking knowledge of at least one foreign language, and, if only one, it should be Spanish. Some philosophy and as much of art, music, and other things apparently having nothing to do with engineering as possible."

A proper balance of classical and technical education for the coming generation of engineers is a subject of deep concern. This is particularly true in view of the endeavors now being made to bring the engineer in closer touch with political and civil life. The best advice must come from those who have reached maturity in their professions.

We hope that our technical societies will not overlook the opportunity of permitting their views to be recorded either in approval or disapproval of the alterations in curricula now being advocated and adopted at our universities.

BY THE WAY

Tasmania is subject to dry spells of a kind that have naught to do with Constitutional amendments and such. As on the mainland of Australia, there exist not only some queer animals that are peculiar to the country but several scattered areas possess alluvial tin deposits. Some of the latter comprise fairly rich spots that are well worth working, provided water can be obtained in sufficient quantity. In at least one case, the government took control of a ditch line and extended it several miles, supplying water to what is known as a "small man's field," on a sliding royalty scale based upon the market price of the product. Some companies installed their own ditches or "water races" 30 and 40 miles long. A few years ago one of the companies was doing fairly well in every other way, but experienced a peculiar difficulty that ran the total costs up to an annoying figure. A little animal called the duck-billed platypus, or *Ornithorhynchus paradoxus*, took to the water like a duck, swam around like an otter, and playfully bored holes in the banks. Coming in increasing numbers, the lady platypi laid eggs and kept on increasing the numbers of her brood and the costs of mining. The Latin name is most appropriate, for the creature is certainly a paradox. It is about a foot and a half long when full grown, has a body like an otter, a tail like a beaver, thick, dark-brown fur, and a broad, horny bill and webbed feet, suggestive of the duck. The male has spurs like a rooster; the female lays eggs in a nest; and the paradox of it all is that it is cold-blooded enough to be classed as a reptile. This nuisance is fond of making its nest near a quiet stream, making the entrance from below the surface of the water and winding along sometimes as much as 50 ft., and then upward to a large chamber. It then raises a ventilating shaft to surface; the latter also serving as a "safety-first" exit in case of emergency. Building such nests along the ditches, they certainly are sons of Belial.

NEW PUBLICATIONS

Illinois Mining Statutes Annotated. (Including All Illinois Mining Laws). By J. W. Thompson. Pp. 594. Bulletin 169, U. S. Bureau of Mines, Washington, D. C.

The Canning River Region, Northern Alaska. By Ernest deK. Leffingwell. Pp. 251, illus. Professional Paper 109, U. S. Geological Survey, Washington, D. C.

North Carolina: Biennal Report of the State Geologist, 1917-1918. Joseph Hyde Pratt, State Geologist. Pp. 110, illus. North Carolina Geological and Economic Survey, Chapel Hill, N. C.

Analysis and Tests of Rigidly Connected Reinforced Concrete Frames. By Mikishi Abe. Pp. 102, illus. Bulletin 107, Engineering Experiment Station, University of Illinois, Urbana, Ill.

Bibliography and Index of the Publications of the United States Geological Survey Relating to Ground Water. By Oscar E. Meinzer. Pp. 169. Water-Supply Paper 427, U. S. Geological Survey, Washington, D. C.

The Geology of the North Coolgardie Goldfield. Part I, The Yerilla District, by C. Sidney Honman; with appendices by R. A. Farquharson and J. T. Jutson. Pp. 98, illus. Bulletin 73, Geological Survey of Western Australia, Perth, Western Australia (1917).

Sooke and Duncan Map Areas, Vancouver Island, by G. H. Clapp; with Sections on the Sicker Series and the Gabbros of East Sooke and Rocky Point, by H. C. Cooke. Pp. 445, illus. Memoir 96, Geological Survey of Canada. Department of Mines, Ottawa, Ontario (1917).

El Petroleo en la Republica Mexicana. Estudio Geologico Economico sobre los Yacimientos Petroliferos Mexicanos. First part. By Miguel Bustamante. Pp. 216, illus. Boletin 35, Instituto Geologico de Mexico, Mexico City.

Abstracts of Current Decision on Mines and Mining, Reported from January to May, 1918, and from May to September, 1918. By J. W. Thompson. Pp. 160 + 138. Bulletins 172 and 174, U. S. Bureau of Mines, Washington, D. C.

Contributions to Economic Geology, 1917. (Short Papers and Preliminary Reports). Part I, Metals and Nonmetals, Except Fuels, F. L. Ransome, E. F. Burchard, and H. S. Gale, geologists in charge. Pp. 304, illus. Bulletin 660, U. S. Geological Survey, Washington, D. C.

Decisions of Courts Affecting Labor, 1917. By Lindley D. Clark and Augustus P. Norton. Pp. 299. Bulletin No. 246 of the U. S. Bureau of Labor Statistics, Labor Laws of the United States Series. U. S. Department of Labor, Washington, D. C.

Physics and Chemistry of Mining and Mine Ventilation. By Joseph J. Walsh. Second Edition. 5¼ x 7¾, pp. 219, illus. D. Van Nostrand Co., New York.

A practical handbook for vocational schools, and for those qualifying for mine-foreman and mine-inspector certificates.

Metal Statistics, 1919. Twelfth Annual Edition. 4 x 6, pp. 447. The American Metal Market, New York.

A compilation of tables giving data regarding production, imports and exports, and prices of iron and steel and the nonferrous metals, over a series of years.

A Geologic Reconnaissance of the Inyo Range and the Eastern Slope of the Southern Sierra Nevada, California, by Adolph Knopf; with a section on The Stratigraphy of the Inyo Range, by Edwin Kirk. Pp. 130, illus. Professional Paper 110, U. S. Geological Survey, Washington, D. C.

A Geological Reconnaissance of the Country Between Laverton and the South Australian Border (near South Latitude 26°), Including Part of the Mount Morgan Goldfield. By H. W. B. Talbot and E. deC. Clarke. (Petrology by R. A. Farquharson). Pp. 207, illus. Bulletin 75, Geological Survey of Western Australia, Perth, Western Australia (1917).

The Charters Towers Goldfield. By J. H. Reid, Government Geologist. Pp. 236, illus. Publication 256. Geological Survey of Queensland, Brisbane, Queensland (1917).

Contents: General Description of Field, History and Technology of the Gold Deposits, Physiography, Geology, Petrology of the Igneous Rocks; The Ore Deposits; The Mines.

Temiskaming Northern Ontario Railway Commission (Ontario Government Railway): Seventeenth Annual Report for Year Ended Oct. 31, 1918. Published by A. T. Wilgress, King's Printer, Toronto, Ontario.

Included is the report of Arthur A. Cole on the mining industry in that part of northern Ontario served by the railway in question.

Coal-Mine Fatalities in the United States, 1918, and Coal-Mine Statistics, Supplementing Those Published in Bulletin 115. Compiled by Albert H. Fay. U. S. Bureau of Mines, Washington, D. C.

In addition to usual data regarding accidents there is included the list of permissible explosives, lamps, and motors tested prior to Jan. 31, 1919.

The Geology and Mineral Resources of the Yilgarn Goldfield. Part III, the Gold Belt North of Southern Cross, Including Westonia, by T. Blatchford and C. S. Honman; also Notes on the Minerals of Westonia, and Petrological Notes, by E. S. Simpson and R. A. Farquharson, respectively. Pp. 321, illus.; plates I—XIX (maps and sections) accompany the report in a separate volume. Bulletin 71, Geological Survey of Western Australia, Perth, Western Australia (1917).

A Summary of Mining in the State of Washington. By Arthur Homer Fischer. Pp. 124, illus. Bulletin 4, Engineering Experiment Station Series. University of Washington, Seattle, Wash.

A thesis submitted in partial fulfillment of the requirements for the degree of master of science in mining engineering. It was prepared under coöperative agreement between the College of Mines and the U. S. Bureau of Mines, and was edited by Milnor Roberts.

Trade of the United States With the World, 1917-1918. Part I, Imports. Miscellaneous Series 78, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C.

Statistical tables of imports into the United States, by countries, and principal articles, during the fiscal years ended June 30, 1917 and 1918, continuing similar tables which have been published from time to time by the Department of Commerce. The figures given in this report are especially valuable at this time, when there is great interest in foreign trade. A similar report of exports, by countries and articles, will follow in a separate publication.

A Preliminary Report on the Mining Districts of Idaho. By Thomas Varley, Clarence A. Wright, Edgar K. Soper, and Douglas C. Livingston (in coöperation with the University of Idaho). Pp. 113, illus. Bulletin 166, U. S. Bureau of Mines, Washington, D. C.

Coöperation between state organizations and the U. S. Bureau of Mines gives promise of producing excellent results. This bulletin describes the achievements on the part of the University of Idaho and the Bureau, presenting a study and review of the mining districts of Idaho. In a compact form it gives much information about the state. and should be well received by the mining industry.

Graphical and Mechanical Computation. By Joseph Lipka. Pp. viii + 364; 6 x 9 in., 205 figures, 2 charts. John Wiley & Sons, New York.

This book is a treatise on the uses of charts, scales, and instruments to represent engineering data and to solve engineering problems. It is a textbook rather than a work of reference, but the treatment is clear, and the ordinary

engineer should find no difficulty in following the explanations given. Some of the subjects covered are: plotting on ordinary and on logarithmic coördinate paper, graphic solution of cubic and biquadratic equations, the plotting of a graph to represent known data, the calculation of equations from graphs, the use of planimeters,and other means of mechanical integration.

Structural Engineers' Handbook. Data for the Design and Construction of Steel Bridges and Buildings. By Milo S. Ketchum. Second edition. 6½ x 9, pp. 950 + xvi, illus.; flexible leather. McGraw-Hill Book Co., New York.

This important and well-known book for the use of the structural engineer, designer, and student, as well as of engineers who may at times have to do with structural problems and design, has now passed into its second edition. The author states in his preface to this edition that details of steel windows and doors, data on cement and gypsum tile roofs, solutions for bending moments in mill building columns, and stresses in stiff frames have been added in Chapter I, and Chapter III, Steel Highway Bridges, has been rewritten and enlarged. All known errors have been corrected.

The Mining Manual and Mining Year Book, 1919. By Walter R. Skinner. 5 x 8½ in.; pp. 1000. Walter R. Skinner, London, E. C., England.

This reference book, which has appeared regularly for thirty-three years, is so well known that detailed comment is no longer necessary. The publisher has spared no efforts to maintain the reputation that the manual has had for completeness and accuracy, and it has been published with commendable promptness, being dated March, 1919. Its arrangement and indexing are good and add to its value as a reference work. Full data regarding capitalization, officials, operations, and financial position of 1170 companies are given, and 2470 additional companies are covered in the supplementary index, which contains the names of those concerns which have either ceased to be of public interest or are in too dormant a state to justify their inclusion in the body of the work. No important innovations have been made, but there has been some condensation of the matter, which it is believed will render it still more convenient for quick reference. The usual lists of directors, secretaries, engineers, and mine managers are included; also the crushing tables and output of the principal gold mines, and the dictionary of mining terms, all of which are regularly revised.

Women in the Lead Industry. By Alice Hamilton. Bulletin No. 253, U. S. Bureau of Labor Statistics, Department of Labor, Washington, D. C.

The susceptibility of women workers in lead industries to certain forms of lead poisoning, and the dangerous effects of this occupational poison on their children, are two important facts emphasized. Lead, which is by far the most common industrial poison, is responsible for no less than 95% of all the poisoning due to occupation, according to Teleky, a German authority. In this country lead poisoning is a fairly familiar occurrence, but until comparatively recent times it has not been common among women workers, because relatively few women have been employed in lead industries. Now, however, women are beginning to enter occupations in which exposure to lead is inevitable, and it is regarded as important to supervise carefully the question of their employment in such occupations and to determine whether it will be better to safeguard them by requiring employers to use every known means to reduce or eliminate the hazard of lead poisoning, or by prohibiting the employment of women entirely in those occupations in which lead poisoning constitutes a considerable hazard.

The bulletin discusses the various lead compounds that are used in industry, noting their comparative danger, suggests how lead may enter the body, and describes in some detail the industries in the United States involving exposure to lead.

The Diagnostics and Treatment of Tropical Diseases. By E. R. Stitt. Third Edition, revised; pp. 534. P. Blackiston's Son & Co., Philadelphia, Penn.

The mining engineer is essentially a man of wide interests. His duties take him to all parts of the world, and his responsibilities often extend far beyond the generally accepted scope of his work. Successful mining operations in tropical regions are practicable only when due regard has been paid to hygienic and medical considerations. The principles of hygiene are the same virtually the world over. Tropical ailments and diseases are, however, in a class by themselves; and combating them by prophylaxis and treatment is a prerequisite to successful industrial work in tropic countries. Nothing can help more to a realization of this than the dissemination of information through the medium of reliable textbooks. The mining engineer is no narrow specialist when he is once in the field. For his own sake, as well as in the interest of those over whom he has control and for whose well-being he is in no small degree responsible, it is imperative that, if his work takes him to tropic countries, he should possess some knowledge of tropic diseases. There is every reason why he should obtain this from a reliable source.

The book under review is written primarily for the practitioner, but interest in such a subject must inevitably extend beyond the medical profession, because it so often happens that doctors are unavailable in isolated tropical localities. The author is a recognized specialist on the subject, and his aim has been to present the data in as clear and simple a form as possible. The general arrangement of the book is excellent, and maps are given to illustrate the distribution of the various diseases covered. The subject matter has been brought strictly up to date, and the treatise is one that should find a place on the bookshelf of every tropic settlement, and whether medical attention is available or not. A. W. ALLEN.

The Mineral Deposits of South America. By Benjamin L. Miller and Joseph T. Singewald. Pp. 598; illus. McGraw-Hill Book Co., Inc., New York.

This book presents, in condensed and well-arranged form, the best example that has come to our notice of what a treatise on a subject such as this should be. It covers an exceptionally wide field—the whole of South America—and the authors, with commendable breadth of view, have supplemented the data and impressions gained during a trip through most of the South American republics, in 1915, with practically all the available information that could be collected from published accounts and personal communications. A feature of the preface is the acknowledgment of assistance received in this connection; and at the end of each chapter a complete bibliography of material published, and dealing with the particular country in question, is given.

The book opens with a chapter on the economic geology of South America, in which the authors draw attention to the fact that geological surveys, adequately supported by the governments of the different countries, would undoubtedly justify the necessary expenditures within a few years. The suggestion is not new, but its reiteration is timely and may well be heeded by our South American neighbors. "The preëminence of the mining industry in the United States," the authors claim, "in comparison with that of other countries, is due in a large measure to the dissemination of accurate information concerning the mineral resources of the country by the Federal geological organization. Every one of the South American countries has failed to appreciate fully the value of such work; and in those countries where a geological organization is maintained it is inadequately supported. The maintenance of an able staff of geologists engaged in the study of the country's mineral deposits would do more to encourage the development of encouraging sections, and to discourage the investment of capital in unlikely districts, than any other factor."

The book supplies a long-felt want; and the authors are to be congratulated on the thoroughness of their work, and also on the clarified form in which so much valuable information has been published. A. W. ALLEN.

Personals

Perry G. Harrison has returned to Salt Lake City from the Lordsburg, N. M., district.

A. W. Allen has been elected a member of the Mining and Metallurgical Society of America.

Harry J. Wolf, of the Malm-Wolf Co., examined mining properties in Arizona early in May.

Frederick F. Sharpless is in the vicinity of Hermosilla, Sonora, Mexico, on examination work.

Hugh K. Picard has been elected president of the Institute of Mining and Metallurgy, succeeding Hugh F. Marriott.

Charles A. Burdick has removed his mining and metallurgical engineering offices to No. 120 Broadway, New York; telephone, Rector 1645.

H. S. Gale, of the U. S. Geological Survey, has completed a study of the potash situation in Alsace and has returned to Paris.

J. R. Finlay, who has been spending the winter in Arizona, is proceeding to California by automobile, visiting the Grand Canyon en route.

J. W. Beede, of the Texas State Geological Survey, is at work with a party in Hueco Basin, east of Sierra Alto Range, in Hudspeth County.

T. M. Owens, of Wallace, Idaho, superintendent of mills for the Federal Mining and Smelting Co., has returned to Australia, his former home.

W. F. Gowans, who has recently returned from France, will take charge of the underground work at the Wright-Hargraves mine, in Kirkland Lake.

John D. Ireland, general manager of the M. A. Hanna & Co., Minnesota interests, has returned from an extended vacation trip in the south to Duluth.

Maxwell W. Atwater, of Butte, general manager of the Davis-Daly Copper Co., is at Mayo Brothers' hospital, Rochester, Minn., undergoing an operation.

J. A. McVichie, who has been in Cobalt for the last 14 years, and was recently manager of the Chambers-Ferland mine, is leaving Cobalt for western United States.

Percy E. Barbour, who until his recent discharge was a captain in the Engineer Corps, U. S. A., has received a commission as major in the Engineer Section of the Reserve Corps.

Robert Linton has returned from a periodical visit to properties of the North Butte Mining Co. at Butte, Mont., and the Consolidated Coppermines Co., at Kimberly, Nevada.

Frank Davis, formerly metallurgist at the Toledo smeltery, near La Dura, Sonora, Mexico, and **W. H. Davidson** are developing property in Lemon mining district, 40 miles east of Alamos, Sonora.

Robert E. Cranston has returned to San Francisco from Washington after serving with the U. S. Food Administration for the last seven months. He will resume the practice of his profession.

A. H. Burroughs, Jr., who has been in charge of construction work on the navy nitrate plant, Indian Head, Md., has obtained his release from active service in the U. S. Naval Reserve Force.

Van. H. Manning has been made a member of the Coal Export Committee of the American Mining Congress, which has been formed to aid American coal producers in obtaining South American business.

A. B. Emery, general manager of the Messina Development Co., Messina, Transvaal, is in Butte studying modern copper smeltery construction with a view to the installation of a smeltery in South Africa.

N. C. Sheridan, mining engineer of Wallace, Idaho, is in Nevada to inspect mining properties near Elko and Palisade, representing New York interests. He will examine low-grade gold properties in central Idaho.

L. H. Goodwin, with the firm of Rogers, Mayer & Ball, at 42 Broadway, has left New York for an extended scouting trip through parts of Canada and the Western states in the interests of the firm and its clients.

Daniel Harrington, of Golden, Colo., mining engineer in charge of safety work in the Rocky Mountains for the Bureau of Mines, is in Butte making plans for a state "first-aid" meeting to be held at Billings, Montana.

Alfred Roos, consulting and mining engineer of Tucson, has been making a geological examination of the Tularosa Basin oil field for an association of Arizona mining men headed by Edward Bush, of Tucson, Arizona.

J. B. Umpleby, of the U. S. Geological Survey, who was called to the Peace Conference as a special adviser on the mineral resources of the areas involved in the settlement, sailed on May 14 on his return to the United States.

Donald Mackenzie is making a geological study of the Tularosa basin in Otero County, N. M., in the interest of E. W. Hartman. Mr. Mackenzie has recently returned from geological work in Brazil, Ecuador, Colombia and Panama.

C. W. Newton, of Wallace, Idaho, manager of the Interstate-Callahan mine, and one of the directors of the company, will attend the annual meeting of directors in New York, which will be held on May 19, instead of in June, as previously announced.

Major A. S. Dwight, D. S. O., originally with the 11th Engineers, returned last week after nearly two years of service in France. Major Dwight is one of the few American officers who has been decorated by the British with the Distinguished Service Order.

John R. Allen, dean of the College of Engineering of the University of Minnesota, has proffered his resignation and will become director of the National Bureau for Heating and Ventilating Research, recently established at Pittsburgh by the Federal Government and the American Society of Engineers.

E. A. Holbrook, acting chief of mining engineering, Bureau of Mines, represented H. Foster Bain, who was selected to represent the American Institute of Mining and Metallurgical Engineers, at a meeting of the conference committee called by the Commissioner of Education, Mar. 31, in Washington, D. C.

Wilfred C. Polkinghorne has been appointed superintendent of the Ahmeek stamp mill, succeeding Joseph Satterly, who has taken a position with the Nash Motor Co. Mr. Polkinghorne has been metallurgist for various Calumet & Hecla subsidiary mills since his graduation from the Michigan College of Mines.

J. D. Mooney, recently discharged from the Army, after having served overseas as a captain with the 309th Ammunition Train, 84th Division, has accepted a position with the General Motors Corporation, New York. Mr. Mooney was manager of the Hyatt Roller Bearing Co.'s industrial division prior to joining the Army in 1917.

Charles L. Hirshman, who has been associated with a number of leading mining companies in the western United States, and has latterly been engaged with the Rapid Transit Subway Co. of New York, has been given charge of the operations of the Atlas Gold Mines, Ltd., in the West Shining Tree district of northern Ontario.

Emmett J. Flynn has been placed in charge of the safety and welfare department of the Republic Iron and Steel Co.'s northern iron mines, with headquarters at Gilbert, Minn. Before entering the Army, where he held a commission as major, Mr. Flynn was for eight years private secretary to Francis J. Webb, general manager of the Republic Iron and Steel Company.

H. Foster Bain, assistant director of the Bureau of Mines, has resigned and will leave early in June for China, traveling by way of Vladivostok. Mr. Bain accepted the post of assistant director in an effort to be of service during the national emergency. **J. C. Pickering,** also of the Bureau, who specialized in gold, silver and platinum, is resigning to go to New York to resume practice as consulting engineer.

Societies

American Bureau of Welding, at a meeting on Apr. 11, at the Engineering Societies Bldg., New York, adopted bylaws and elected officers. Regular meetings are to be held on the third Friday of each month. The bureau voted to establish a research committee for carrying out plans of coöperation in conducting investigations and tests.

American Institute of Mining and Metallurgical Engineers, at the autumn meeting, at Chicago, will include a symposium on pyrometry, when 20 papers, it is expected, will be presented on this subject. Paul D. Foote is secretary of the pyrometer committee.

American Institute of Mining and Metallurgical Engineers, Montana Section, had as guests recently at a banquet at the Silver Bow Club, in Butte, James F. Kemp, professor of geology at Columbia University, and Charles K. Leith, mineral adviser to the Shipping and War Industries Boards. Messrs. Kemp and Leith have been called to Butte as experts in connection with the suit of the Elm Orlu against the Butte & Superior. Frederick Laist, general manager of the Anaconda's smeltery plants at Anaconda and Great Falls, Mont., presided as toastmaster. Prof. Kemp in an address briefly reviewed the work accomplished by the American Institute of Mining and Metallurgical Engineers. Mr. Leith spoke of his war-zone observations.

American Society for Testing Materials has issued a provisional program of the 22d Annual Meeting at Atlantic City, N. J., June 24 to 27; headquarters, Hotel Traymore. The features of special interest announced will be the presidential address, the memorial session, a topical discussion on magnetic analysis and a joint session with the American Concrete Institute on cement and concrete. Other sessions will include the following: "Preservative Coatings, Lubricants, and Containers"; Steel and Wrought Iron"; "Corrosion and Magnetic Analysis"; "Malleable Iron and Non-Ferrous Metals"; "Ceramics, Lime and Road Materials"; "Concrete and Gypsum." Committee meetings will be held on June 25 and the annual golf tournament on June 26. The following nominations for officers are announced by the committee: For president, J. A. Capp; for vice-president, C. D. Young; for members of the executive committee, Ernest Ashton, H. F. Moore, C. F. W. Rys, and Admiral D. W. Taylor.

The American Society of Mechanical Engineers will hold the spring meeting at the Hotel Statler, Detroit, from June 16 to 19. A session on June 17 on the subject of "Industrial Research" will be held under the auspices of the Research Committee of the A.S.M.E. Several papers and reports will be presented. This is to be made a leading subject, because of the great impetus which has been given to industrial research as a result of the conditions resulting from the war. The afternoon session will be on the subject of "Industrial Relations," with several addresses by men of national reputation. This session will constitute an interchange of views as to what must be done to assure industrial peace. On June 18 a session in charge of the Detroit local committee and of several of the other sections of the society will be held, and technical papers will be contributed by members of these various sections. Also a gas power session with discussion on oil engines. The closing session, on June 19, will have discussion of fuels, including powdered fuel and oil fuel. The Detroit local committee is arranging many events for the entertainment of the members of the society and others who may attend. Among those will be an afternoon and evening devoted to a boat ride on the lake, during which dinner will be served.

Industrial News

The Chicago Pneumatic Tool Co. has moved its Milwaukee office from Room 1305 Majestic Bldg., to Room 1418 in the same building.

Alfred W. Pick, mechanical engineer, announces removal of his engineering and drafting offices to 506-07 Quincy Bldg., 17th and Curtis Sts., Denver, Colo. Phone, Main 902.

Standard Electric and Elevator, Inc., of Baltimore, has opened a New York office at 280 Broadway, in charge of C. A. Harrington, formerly sales manager of the company.

American Malleable Castings Association, Cleveland, Ohio, has issued a treatise on malleable iron, which is a forerunner of a comprehensive volume to be issued later. A copy of this book will be sent upon application to the association at Cleveland, Ohio.

Cableways. Lidgerwood Manufacturing Co., New York. Bulletin 34; 9 x 12; 12 pp.; illustrated. Descriptive of Lidgerwood cableways and transfers for storing and reclaiming coal, and handling ashes and similar material. A perforated specification sheet is included, with blank spaces for furnishing data in making estimates.

The Stephens-Adamson Manufacturing Co., of Aurora, Ill., has appointed Fred W. Wells as assistant engineer of the New York district office. Mr. Wells was associated with this company prior to his enter-

ing the service early in 1918. He was commissioned first lieutenant in the 26th Engineers, served in various sections of France and with the First Army during the Argonne-Meuse operation.

The Hardinge Conical Mill Co. reports the honorable discharge from war service of J. C. Farrant, its London manager. Mr. Farrant for over four years was held a prisoner of war in Germany. First Lieut. J. J. Cadot, of the Air Service, A. E. F., returns to take charge of the company's Denver office. Capt. Harlowe Hardinge, Signal Corps, director of radio schools in the A. E. F., will return to his duties as vice-president of the H. C. M. Co. in the New York office. The Hardinge company anticipates the early return of three more of its staff.

Black & Decker Manufacturing Co., of Baltimore, Md., manufacturers of portable electric tools, electric air compressors and special machinery, has just established a New York office—Room 2920, Equitable Bldg.—which will be in charge of G. R. Lundane, who will supervise the distribution of the company's products in New York City and surrounding territory, including the State of Connecticut. The Black & Decker Manufacturing Co. now has branches in New York, Philadelphia, Atlanta, San Francisco, Chicago, Detroit, Columbus, Buffalo, and Boston, the general offices being at Baltimore, Md. The company also has foreign connections in England, France, Norway, Sweden, and Japan.

Noruberg Manufacturing Co., Milwaukee, Wis., announces the development of a new type of uniflow poppet valve engine. This company was the first to develop uniflow engines in this country, and the advantages of that type in maintaining high economy at underloads and overloads is well known. The new Nordberg-Todd uniflow engine is built in sizes ranging from 200 to 2000 h.p. for any available steam pressure, any available superheat, any available vacuum and any available back pressure. The assertion is made that under any of these conditions these engines will operate with lower steam consumption per horsepower, over wider variations of load, than any steam prime mover thus far developed. Of special interest is the fact that the engine can be changed from condensing to non-condensing operation, or the reverse, while running.

Trade Catalogs

Rails and Accessories.—Walter A. Zelnicker Co., St. Louis. Bulletin 258, descriptive of rails, all weights and sections, with fastenings, girders, guards, bars, crossings, frogs, switches, spikes, tie plates, portable track, and similar parts., in stock at the company's East St. Louis works and various points throughout the country, permitting quick shipments at low freight rates.

"Over 1000 Scoop Conveyors" is the title of a 20-page folder just published by the Portable Machinery Co., of Passaic, N. J. This folder, replete with illustrations showing the various uses of the scoop conveyor, describes clearly the labor, time, and money-saving features of the machine in storing, reclaiming, loading, and unloading coal, coke, ashes, sand, gravel, crushed stone, fertilizer, cement, chemicals and like materials. Copies of the folder will be sent free to those interested, upon application to the manufacturers.

Carbide Lamps, Hardware Specialties. Justrite Manufacturing Co., Chicago. Catalog 6 x 9; 88 pp.; illustrated. Descriptive of miners' cap lamps with various types of feed; metal mine lamps up to 5-hour capacity; superintendents' lamps, lanterns, drivers' headlights and mine car lamps. A large number of accessories, including various repair outfits, tip cleaners and reamers, containers, reflectors and other parts, are also described in detail. The catalog contains much valuable and complete information on the subject of mine lamps. Other specialties described are safety oil cans, waste receptacles, garbage pails, and oil cups for loose pulleys.

Bailey Electric Furnaces. The Electric Furnace Co., Alliance, Ohio. Booklet 5-B; 8½ x 11; 24 pp., illustrated. Descriptive of the following types of Bailey electric resistance furnaces for melting non-ferrous metals: Tilting 1500-lb. brass furnace of two hours' melting time; non-tilting or tapping type with 600 kw. transformer of melting rate of two tons of brass per hour and hearth capacity of nine tons; 1000-kw. zinc cathode of 200 tons' daily capacity; 105-kw. nose-tilting, motor-operated type, hearth capacity of 5000 lb., melting rate of 2000 lb. per hour. Comparative melting costs using coke, oil, and electricity, and tables of records of melting phosphor bronze, zinc cathodes, and reduced metal loss in brass melting, are given.

New Patents

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each.

Alumina. Production of Alumina. Anson G. Betts, Asheville, N. C. (U. S. No. 1,300,110; Apr. 8, 1919.)

Aluminum Alloy. Charles Van Amburgh, Tacoma, Wash. (U. S. No. 1,300,058; Apr. 8, 1919.)

Amalgamating Machine. William B. Tucker, Healdsburg, Calif. (U. S. No. 1,300,054; Apr. 8, 1919.)

Belt Scraper. Frank A. Goodykoontz, Miami, Ariz. (U. S. No. 1,299,324; Apr. 1, 1919.)

Blast Furnace. Frank Oskar Miller, Portsmouth, Ohio. (U. S. No. 1,298,761; Apr. 1, 1919.)

Loading Machine. Robert P. Greenleaf, Cleveland, Ohio, assignor to Frank Billings, Cleveland, Ohio. (U. S. No. 1,297,150; Mar. 11, 1919.)

Mine-Car Wheel. Henry W. E. Brosi, Girard, Kan. (U. S. No. 1,296,914; Mar. 11, 1919.)

Mining Machines, Drive Gearing for. James A. Brantley, Sand Springs, Okla. (U. S. No. 1,297,647; Mar. 18, 1919.)

Oil Shale—Obtaining Oil From Shale. Frederick G. Shreves, Denver, Colo. (U. S. No. 1,297,022; Mar. 11, 1919.)

Ore-Charging Machine for Retorts. Jozeph Nieznalski and Jan Belczynski, Detroit, Mich. (U. S. No. 1,296,998; Mar. 11, 1919.)

Pick. Thomas F. Bird, Wilkes-Barre, Penn. (U. S. No. 1,297,065; Mar. 11, 1919.)

Platinum—Composition of Matter for Platinum Substitute. Frank A. Fahrenwald, Cleveland, Ohio, assignor to the Rhotanium Co., Cleveland, Ohio. (U. S. No. 1,296,938; Mar. 11, 1919.)

Potassium—Process of Extracting Potassium From Minerals. Henry Blumenberg, Jr., Los Angeles, Calif., assignor to Chemical Construction Company, Los Angeles, Calif. (U. S. No. 1,296,457-58; Mar. 4, 1919.)

Potassium Compounds, Process of Obtaining. George F. von Kolnitz, Stockertown, Penn. (U. S. No. 1,296,141; Mar. 4, 1919.)

Potassium Nitrate—Process of Producing Potassium Nitrate. Henry Blumenberg, Jr., Los Angeles, Calif. (U. S. No. 1,296,460; Mar. 4, 1919.)

Potassium Sulphate, Process of Producing. Henry Blumenberg, Jr., Los Angeles, Calif. (U. S. No. 1,297,638; Mar. 18, 1919.)

Refining—Electrolytic Refining of Metals. Blasius Bart, Newark, N. J. (U. S. No. 1,295,100; Feb. 25, 1919.)

Roasting—Ore Roasting Furnace. Edwin T. Goldthorpe, Chicago, Ill., assignor, by direct and mesne assignments, of three-eighths to Fred Von Nessen and three-eighths to William H. Dicks, Chicago, Ill. (U. S. No. 1,295,729; Feb. 25, 1919.)

Salt—Process of Extracting Salt From Natural Brines. Arthur E. Schaefer, Saginaw, Mich. (U. S. No. 1,297,737; Mar. 18, 1919.)

Separation—Mineral-Separating Apparatus. Allison S. Loventhal, Birmingham, and Emmett C. Nunnelley, Ashland, Ala. (U. S. No. 1,297,372; Mar. 18, 1919.)

Separator — Precious-Metal Separator. John James Roberson, Springville, Utah, assignor of one-half to James I. Rounds, Colton, Utah. (U. S. No. 1,297,911; Mar. 18, 1919.)

Ventilating Apparatus for Mines. Daniel F. Lepley, Connellsville, Penn. (U. S. No. 1,297,191; Mar. 11, 1919.)

Zirconium Ores, Process of Purifying. William R. Loveman, Lakewood, Ohio, assignor, by mesne assignments, to National Carbon Co., Inc. (U. S. No. 1,297,371; Mar. 18, 1919.)

Editorial Correspondence

SAN FRANCISCO, CALIF.—May 10

Total Crude Oil Production in California from beginning of the industry to end of 1918 amounted to 1,141,988,484 bbl. The records of production begin with 1876. Prior to that year the estimated production was 175,000 bbl., credited to Ventura-Newhall fields, and those fields are the only producers of record up to 1894, though wells were drilled in four other areas prior to that year. The following summary showing the life and total production by fields is taken from a complete tabulation of production by fields for each year published in the "Standard Oil Bulletin" for April: Midway, 18 years, 254,508,060 bbl.; Coalinga, 23 years, 213,155,797; Kern River, 19 years, 206,566,725; Whittier-Fullerton, 22 years, 140,487,718; Santa Maria-Lompos, 17 years, 88,057,211; Sunset, 19 years, 71,363,027; McKittrick, 21 years, 55,165,388; Los Angeles-Salt Lake, 25 years, 54,300,112; Lost Hills-Belridge, 9 years, 33,846,134; Newhall-Ventura, 43 years plus, 21,311,263; Summerland, 25 years, 2,234,947; miscellaneous fields, 22 years, 992,102 barrels.

BUTTE, MONT.—May 9

Anaconda's April Production was 13,750,000 lb. of copper, compared with 13,900,000 in March and 26,500,000 in the same month a year ago. April of 1916 was banner month in history of company, when 33,300,000 lb. was produced. April silver production, 687,500 oz. Orphan Girl property, where orebody was recently cut, is shipping daily about 100 tons silver-zinc ore. Further development of Bonanza group of claims in southwestern part of Butte district was suspended and option given up after failure to find ore, although approximately 5000 ft. of shaft sinking, drifting, and cross cutting was done. Steward shaft being sunk from 3200 to the 3800 level. Development work and efficiency program are occupying attention of the company. Operations continue 60% of normal.

Anglo-Saxon orebody cut on the 500-ft. level of the Orphan Girl property of the Anaconda Copper is attracting much attention in local circles in consequence of the heavy tonnage indicated, and, in the opinion of the Anaconda's engineers, no more promising development in years has been had than this, the milling-ore width being more than 35 ft., with indications of a possible 50, all of it averaging about 14 oz. of silver, about 15% zinc, and carrying lead and gold. Two more fissures remain to be developed on the 500-ft. level of the Orphan Girl mine, the Orphan Girl and the Orphan Boy veins, both of which show ore, the former about 15 ft. in width at the surface and the latter 2½ ft. where the fissure was crosscut on the 500. The Orphan Boy shoot is to be drilled, the ore carrying high silver and high zinc content. The Anglo-Saxon orebody is the second large deposit to be opened in what is termed the "west side" of the Butte district, the other being at the Hibernia mine of the Davis-Daly Copper Co., where an ore width of 35 ft. has been uncovered, all of it averaging 22 oz. of silver and about 19% zinc, with lead and gold.

DENVER, COLO.—May 10

Work for Miners is plentiful in the leading mining camps of Colorado. In the Cripple Creek district the larger mines are in great need of skilled American miners. The

Vindicator Consolidated Gold Mining Co. can use 25 to 30 first-class men at once. The Portland Gold Mining Co., Cresson Consolidated Gold Mining Co., Rose Nicol and many others are short handed. The managers say they want good American miners and they do not desire to employ foreign labor if Americans can be found to do the work. Mine managers in other leading camps of the state are in the same position. At the present time there are jobs for over 400 men in the Telluride section alone. The Liberty Bell mine, which was recently shut down on account of power-plant troubles, is open again and in need of men. The Humboldt properties will resume operations early in May and can use over 100 men. Other mining companies in need of men are: Tomboy Gold Mines Co., Ltd., Smuggler-Union Mining Co., Belmont-Wagner Mining Co., and Black Bear Mining Co., all at Telluride. Over 200 men could find employment in these mines. The Primos Chemical Co., now rebuilding its mill near Vanadium, will need several hundred men in August, and could use 25 to 50 at the present time. Telluride operators have announced that there will be no cut in wages.

WALLACE, IDAHO—May 8

Labor Shortage has come to be a serious matter in the Coeur d'Alene district, and this in the face of the fact that the mines have generally reduced their forces on account of the low price and weak market for lead. It is believed that the high wages paid in the agricultural districts of the northwest and also in the lumber woods are the cause of the shortage, men preferring that class of work during the spring and summer rather than work in the mines.

The Second Class in Vocational Training of miners has been organized by Director Frank H. Skeels through an arrangement with James F. McCarthy, manager of the Hecla mine. The class will be engaged in extending a raise that is being made from the 900 to the 300 level. The work is being done under contract, and Mr. Skeels expresses confidence that the success achieved by the first class, which made better than wages drifting under contract in the Morning mine, will be duplicated at the Hecla. The experiment in vocational training of miners in this district is being watched with much interest by operators, who see in the system the possibility of eventually raising the standard of efficiency of underground employes.

The State Bureau of Mines and Geology, which was created by the last session of the Idaho Legislature, has effected organization and outlined plans for work for the next two years. The immediate plans of the bureau are set forth in resolutions adopted by the board of control, in which it is stated that the policy of the board will be to cause to be made such geological and topographical investigations as will stimulate the development of all districts showing indications of containing metallic or nonmetallic mineral deposits of economic value, and to make the results of such investigations available at the earliest possible moment. Announcement was also made that the present coöperative agreement with the U. S. Bureau of Mines in carrying on research work in Idaho would be renewed upon the expiration of the present agreement on June 30. Likewise, an agreement will be perfected with the U. S. Geological Survey for the completion of a detailed topographical survey of the Teton coal basin and for a certain amount of coöperative geologic work. Arrangements were also made for the immediate publication of a report of the geological work recently completed in central and northern Idaho. The Legislature appropriated $30,000 for the maintenance of the bureau for two years, distributed as follows: For coöperative work with the U. S. Bureau of Mines, $15,000; for coöperative work with the U. S. Geological Survey, $10,000; for geological and economical investigations of the mineral resources of the state, $5000.

Coeur d'Alene Mines experienced a great slump in production and profits during 1918, as compared with the record of 1917, a result that was due chiefly to insufficient and inefficient labor. With the exception of zinc, the average prices of metals were higher than in 1917, the price of zinc being only a fraction of a cent less, and the war demands maintained a steady market up to the time of signing the armistice. Wages and the cost of mining material and supplies were somewhat higher, but it is evident, from the reports just filed with the county assessor, that the real difficulty was inability to produce the tonnage with the labor available. The war drew heavily upon the mines for men, and the high wages in the shipyards on the coast attracted labor that would otherwise have found employment in the mines. Under the mining law of Idaho, mining companies are required to pay taxes on their net profits in addition to the usual property tax on real estate and improvements, and at the same rate. To determine the net profits for the purpose of taxation, the companies are required to file with the county assessor each year, on or before May 1, detailed statements, under oath, showing tons of ore extracted, gross value, cost of extraction, freight and smelting costs, expenditures for betterments and repairs, and net profits. These statements have now generally been filed. The gross value of ore produced for the calendar year 1918 was $26,307,367, and net profits were $7,970,353. These figures include all profit-earning companies except the Gold Hunter and Richmond. A fair estimate of the profits from these two is $150,000, which would bring the total net earnings of the mines of this district up to $8,120,355. The returns for 1917 showed the gross value of ore produced to be $39,677,689, and the net profits for that year were $12,765,113. As a matter of interesting comparison, the gross value of ore produced and net profits of the principal mines of the district for the years 1918 and 1917 are here given:

	Gross Value	Net Profit
1918		
Bunker Hill & Sullivan	$6,094,285	$1,379,318
Caledonia	1,096,776	647,819
Federal (Morn'g mine)	3,079,144	761,369
Hecla	4,902,611	1,984,820
Hercules	6,193,539	1,915,766
Interstate-Callahan	1,833,671	272,330
Tamarack & Custer	2,211,457	696,868
1917		
Bunker Hill & Sullivan	$9,584,963	$2,447,285
Caledonia	1,849,254	1,227,155
Federal (Morn'g mine)	4,620,344	1,319,962
Hecla	4,462,030	1,895,065
Hercules	9,880,978	3,690,400
Interstate-Callahan	3,250,835	1,234,063
Tamarack & Custer	1,338,321	350,857

Hecla maitained normal production in 1918 through good fortune in securing men, and advanced from third to first place in net profits. Caledonia employs only about thirty men and was not materially affected by labor shortage. The increased production and profits of Tamarack & Custer in 1918 are explained by the fact that the mine was inactive during part of 1917 while a new mill was being constructed. A new company made its appearance in the list of profit earners last year in the Yukon Gold Co., which operates a steel dredge on Prichard Creek and reported handling 1,487,706 cu.yd. of gravel, having a gross value of $177,140, and which yielded a net profit of $81,962. The Interstate-Callahan was closed down several months in 1918.

BIRMINGHAM, ALA.—May 5

Alabama Chapter of the American Mining Congress was to be organized at a meeting called for May 1. The preparing of a compensation law for Alabama was to be one of the important subjects to be considered. There is also considerable interest in the mining congress's efforts to standardize employers' liability laws throughout the United States, modification of the Sherman anti-trust laws, and securing recognition in the President's Cabinet.

HOUGHTON, MICH.—May 10

Approximate Shipments of Rock for the month of April are as follows: Champion, 38,000 tons, as compared with 45,000 for March; Baltic, 22,000, the same as March; Trimountain, 15,000, the same as March; Wolverine, 24,000, as compared with 26,000 for March, and Mohawk, 49,000, as compared with 50,000 for March. Michigan shipped 5240 in April, the same as March.

IRONWOOD, MICH.—May 10

Labor Agitators scattered thousands of pamphlets printed in several languages through the mining sections of the Ironwood district in an attempt to gain members for the I. W. W. and to start a May Day strike for a six-hour day. In the latter they failed completely. Few if any men "struck," and there were no public demonstrations. Wages are over $6 per eight-hour day for miners, and, anyway, the men would be reluctant to strike when they know that a great many miners are unemployed in the Michigan mining districts.

DULUTH, MINN.—May 10

Minnesota Has More Iron Ore now than it had in 1907, according to figures set forth in a recent report of the State Tax Commission. By discovery, exploration, and development the unmined reserve, which was 1,191,969,757 tons on May 1, 1907, had been increased to 1,455,568,770 tons on May 1, 1917, in spite of 303,212,769 tons which were shipped out of the state in the interim. Of the increase, the Cuyuna Range is credited with 70,857,865 tons, a small tonnage is in the Vermilion Range, and the remainder in the Mesabi Range.

SALT LAKE CITY, UTAH—May 10

Salt Lake Stock and Mining Exchange Brokers are beginning to file bonds to meet the requirements of the new state law (going into effect May 12) regarding stock transactions. The law requires the filing of a $5000 bond by any broker engaged in putting a stock or security on the market, and many brokers are not waiting for a specified occasion to arise, but are filing bonds ahead of time so as to be prepared for contingencies. Other fees which must be paid by brokers operating here are: $25 to the city, $60 to the U. S. Government, $10 to the state and $100 for the privilege of operating on the exchange. Unusual activity on the exchange during the last days of the month has brought the total of sales for April to 1,667,686, of a value of $361,720, which represents the largest volume of business in one month for some time. In general, though sales are not keeping up to the rate of the record days, it is felt that the light trading of recent months incident chiefly to conditions prevailing in the mining industry in this section, and now showing some improvement with the high price of silver, is giving way to more normal activity.

A Strike at Park City resulted in the closing of the mines of the district. The walk-out occurred on the morning of May 7, the men having presented their demands to the mining companies the evening of May 5, without warning. The terms asked are extreme, and on their face impossible of fulfilment. They are in the main a six-hour day and pay at $5.50, with two men on a machine. Also, guarantee against discrimination because of any affiliations of the men is asked. Present wages are $4.50 and $4.75 per day. The strikers voted to allow men on pumps and engineers to remain at work until the evening of May 7. At the present writing, the pumps at the Silver Hill shaft of the Silver King Coalition, where the damage of flooding, although the cause of large expense in the future, would not be irreparable, have been pulled. In the case of the Ontario, where the orebodies at depth are not high grade, and flooding would probably result in an indefinite period of idleness, the pumps late on the night of May 7 were operating under sheriff's guard. The other mines of the district—the Judge, the Silver King Consolidated and Daly West—are dry. In view of the extreme nature of the demands made by the miners, it is felt that the strike has not been brought in the hope of obtaining demands felt by the men to be legitimate, but that it has been fomented as sabotage by some outside organization, such as the I. W. W. and alien associates, with the distinct purpose of embarrassing the industry. This is also borne out by the fact that the strike is unpopular with a large number of resident miners, who have a strong feeling against the movement. The local union of the Western Federation of Miners is said to be in no way connected with the strike.

WARREN, ARIZ.—May 10

Copper Companies of the Warren District, the Calumet and Arizona Mining Co., the Shattuck Arizona Copper Co. and the Copper Queen department of Phelps Dodge Corporation are redeeming their promise to find jobs for the returning soldiers. In spite of the adverse conditions which prevail in the copper market, they are putting returning men to work each week; one company has found places for 168 soldiers since Dec. 1. Of this number, 70 had not worked for the company previously. The policy of the companies in pushing development work at this time will in all probability make room for the new men without displacing any of the old employees.

JOPLIN, MO.—May 10

Electrolytic Zinc Refinery to be constructed immediately at Picher, Okla., is planned by the Oklahoma Ore Storage Association, according to an announcement of J. McNicholas, secretary and manager. Experiments have been carried on at Orange, N. J., recently, for the company, tending to prove the availability of this district's ores for electrolytic treatment. The plans of the company at present do not include the erection of a large roasting plant. The management hopes to persuade producers to erect roasters at their individual properties.

Attempted Sale of the Royal Mine, at Picher, Okla., recently, was a failure. It was stipulated that the property must bring at least $3000 in excess of debts, and the

debts amounted to $40,000. There was not a single bid. The sale was brought about by a legal tangle. It is believed that the mine is a good one, but the demand for zinc mines just now is exceedingly light. In direct contrast with this circumstance, however, is the announcement that the Commerce Mining & Royalty Co., of Miami, Okla., has just sold a 9% royalty interest in the Blue Bonnet mine, east of Picher, for $65,000. The Blue Bonnet has been operating only a few months, but has been shown to be one of the best properties in the field. It has been paying a royalty charge of 20% and the 9% reduction at a cost of $65,000 was decided upon by W. H. Logan, manager and one of the principal owners of the property, after a careful computation of the mine's prospective value, as shown by ore recovery and ore blocked out.

Revision of Royalty Charges in this district is about to become a fact. J. W. Howell, special supervisor of Indian affairs and chief attorney in probate service in the Department of the Interior at Washington, has, after careful study, decided upon a new system of royalty charges to apply to the Indian-owned land in the field, which includes virtually all of the zinc lands in the Oklahoma section. According to this plan, the recovery and royalty charges shall be the same. That is, if a mine is making a 7% recovery it will pay 7% royalty to the land owner, so long as zinc ore sells for $50 per ton or less and lead for $65 per ton or under. With each increase of $10 per ton in the selling price of ore, an additional 1% royalty shall be charged. Thus, if ore was selling for $100 a ton, a mine recovering 7% would pay 7 plus 5, or 12% royalty. A minimum royalty of 5% and a maximum of 20% is provided. Judge Howell arrived in Joplin on May 10, and will remain in the district, with headquarters at Miami, probably for one month. During this time it is expected that most operating companies will appeal to him for a revision of their royalty charges, as at most properties the pyramiding of royalties has made these charges excessive. While here, Judge Howell also will investigate several Indian land controversies that are pending and will consider the petition of the people of Picher, Okla., for the removal of the restrictions to town-site properties.

TORONTO, ONTARIO—May 10

The Railroad Project in the Kirkland Lake district will remain at a standstill for the present, according to a decision of the government, and in the meantime a good motor road will be built from the railway to the mines. Apparently this will be more satisfactory to companies than a railway. It is expected that the road will cost from $60,000 to $70,000. A motor road will also be built from the railway at Elk Lake into the Gowganda camp, costing from $250,000 to $300,000, and it has also been decided to build a good motor road in the Porcupine district, connecting all the mines.

VICTORIA, B. C.—May 3

A Gold Strike which is attracting attention is reported on the Morley River, about 150 miles to the northeast of the town of Skagway and just a few miles south of the international boundary. Morley River runs into Teslin Lake. The surface dirt is said to pay from 30 to 50c. Bed rock has not yet been struck. It is expected that there will be a rush to the new diggings with the opening of the summer season.

An Immense Cave-In has occurred in the workings of the Granby mine, at Phoenix B. C. No serious damage, however, is reported, as such an occurrence was not altogether unexpected. The Great Northern and Canadian Pacific Ry. companies' rails are not being used in the vicinity of the break, and a temporary interference with transportation consequently has resulted. Residents are moving from the affected area.

Affairs of the Dolly Varden Mining Co. promise to reach a settlement without loss of time. It has been reported authoritatively that the company admits the claim of the Taylor Engineering Co., which amounts to $462,628.28. This was expended in the construction of 18 miles of railway from tidewater in the Alice Arm district, B. C., to the Dolly Varden mine. Payment of the sum must be made to the engineering company within 30 days, and it is assured that the admission of the claim is an indication of the company's readiness to settle within that period. If this is so, the title to a good mine as well as to the railroad which taps some promising mining country in the Northwest will be cleared, the mining company will be in a position to sell or to operate, and activity and prosperity should return to the section affected. The Taylor company, too, will be able to pay its creditors, among whom are 100-odd workmen who were engaged on construction and who have been impatiently waiting for their wages.

The Mining News

ALASKA

ALASKAN COPPER SHIPMENTS for March were 2986 gross tons of domestic copper ore and matte, to the United States; copper contents was 1,471,398 lb., valued at $294,437.

W. F. ROCK will operate property at Wasilla this year to full capacity. Has just shipped in compressor drills and mill supplies. Gold property.

LADYSMITH SMELTERY, which recently took over W. A. Dickey property at La Touche, expect to remove all machinery to other properties which are in prospect stage. La Touche property will be enlarged and new machinery installed.

ALASKA MINES (Fidalgo Bay)—Expect to install compressor, recently bought, this summer. Good copper ore. Mine has been operated by hand. Mr. Twitchel, care San Juan Fish Co., Seattle, Wash., interested.

JUALIN ALASKA MINES (Jualin)—Will let contract soon for tunnel, as Manager Titus is expected back from Atlin, B. C., in the near future. Will be longest tunnel project since Gastineau tunnel was driven.

ALASKA JUNEAU (JUNEAU)—Expects to make improvements at mill, having recently raised necessary money.

ALASKA TREADWELL (Treadwell)—Sending prospecting party from San Francisco June 1 for Alaska. Outfit will be complete, including compressor drills, drill sharpener and mill equipment. All purchases will be made at the company's San Francisco office.

ARIZONA

Gila County

GILA MONSTER (Globe)—Developing old Mack Morris, Richmond, and La Plata mines, in Richmond Basin. Old dumps will be worked. Crosscuts at 70-ft. depth in Richmond show good ore. Ten-stamp mill will be built. W. H. Seamon, superintendent.

INSPIRATION CONSOLIDATED (Miami)—April production was 6,900,000 lb. copper.

PORPHYRY MINING (Miami)—Being consolidated with Barney. Combination, also includes part of Philadelphia property above Miami, recently acquired by Porphyry company.

Greenlee County

ARIZONA COPPER (Clifton)—Extensive changes under consideration. To provide work for Mexican labor when Metcalf property shut down recently, men were given road work; because one shirker was discharged, whole gang quit. Work will not be continued at this time.

S. G. MURILLO (Clifton)—With Clifton-Morenci associates optioned seven gold claims in Sierra County, N. M. Work will be started at once on extensive development.

ASH PEAK MINING CO. (Duncan)—Preparing to install 100-ton cyanide mill; 9-ft. vein opened for 600 ft. on 800 level. Quartz ore carrying gold.

DETROIT COPPER (Morenci)—Planning to either remodel old mill or erect new mill. W. H. McLain, superintendent.

STARGO SYNDICATE (Morenci)—Planning 100-ton cyanide plant. J. M. Callow and J. H. Watson making ore tests at No. 6 concentrator of Arizona Copper Co. J. M. Hannon, manager.

Pima County

AJO-CORNELIA (Ajo)—Reorganized by Ajo men, who paid debts and moved headquarters from Miami to Ajo. Frank Z. Steele, president. Consists of 14 claims, adjoining New Cornelia on east. Shallow inclined shafts developed good ore, carrying gold and silver.

NEW CORNELIA (Ajo)—Leaching suspended for a time through failure of water supply, owing to fire in pump station in 640-ft. main well. Water for camp brought in by tank cars from Gila Bend, 42 miles distant. Five carloads sulphide sent daily to C. & A. smeltery at Douglas. New 1000-ft. haulage drift for flotation plant more than half finished. Second gloryhole started south of first.

Pinal County

SOUTH RAY COPPER CO. (Kelvin)—Operations begun May 1 at old Norman or Ripsey group, about 16 miles from Kelvin, under direction of W. B. Duvall. Shaft will be unwatered and retimbered. Plans further exploration of copper orebodies developed at 500 ft. depth under former management.

TROY ARIZONA (Kelvin)—Development in Climax shaft continues to open up ore in shoot cut near surface. Drifting continues on vein from Alice crosscut. J. C. Devine in charge.

U. S. VANADIUM DEVELOPMENT (Kelvin)—Under lease to Allied Metals Co., of Denver, for a year. Recently returned to possession of owners, who plan additional exploratory work.

ARIZONA HERCULES (Ray)—Completed pumping plant on leased ground from Kelvin Sultana Copper Co., at Kelvin. Water carried across Gila River in 12-in. redwood stave pipe line on suspension bridge having span of approximately 500 ft. Two large Scranton pumps of 1000 gal. per min. capacity, operated by 200 hp. motors, installed.

GREAT RAY COPPER CO. (Ray)—Churn drill on ground; plans to resume drilling operations this month.

Santa Cruz County

GOLDEN ROSE (Patagonia)—Developing. August Brodine in charge.

HARDSHELL (Patagonia)—Placing new compressor and hoist.

LAYMAN SYNDICATE (Patagonia)—Jerome capital will take over Pierce-Gardner and Blue Nose. Former shipped last three months 27 cars silver-lead sulphides. James Layman and W. E. Moore, principals.

MORNING GLORY (Patagonia)—Preparing to begin work.

WORLD'S FAIR (Patagonia)—Application for receivership made by Frank Powers, claiming, under bond given by him, April, 1918, A. A. Holland agreed to provide adequate mill and do certain work and that Holland has failed to keep his contract. Mill is alleged to be saving much less of the metal contents than it should, and it is contended that proper development work is not being done.

Yavapai County

UNITED VERDE EXTENSION (Jerome)—Assigning one-eighth acre garden patch to any employee, ground ready for seeding, water furnished by company free. B. Huser, agriculturist, employed by company to assist and advise. Many applications for tracts already made.

ARGONNE (Mayer)—Newly organized company purchased 23 claims of Frank E. Andrews, Guy Mosely, and W. A. Murphy, for $50,000.

Yuma County

JOHNSON (Quartzite)—Reported sold by Joe Johnson to Boston company for $250,000. Has strong ledge quartz, sampling high in gold.

YUMA CONSOLIDATED (Quartzite)—Using steam shovel on cement placer ground, employing 150 men.

ARKANSAS

Independence County

CAVE MANGANESE (Batesville)—Preparing to put in switch which will run directly under property. Ore can then be loaded directly from mine into cars. Also plan putting in crushing plant for crushing stone for road building. Office at Peters Bluff.

OZARK (Batesville)—First dry cleaning plant put into successful operation by McSpadden and associates. Has capacity of 150 tons a day, and said to make clean saving. Being operated on manganese ore.

OZARK WONDER (Batesville)—W. A. McClure, one of the owners of this manganese mine, formerly known as Lucky Mack, states shaft being sunk and taking out good tonnage of boulder ore. Prospecting also disclosed body of red lead ore, and 5 ft. vein of phosphate rock. Expect to install small crushing plant to handle latter. Lately purchased adjoining 160 acres.

CALIFORNIA

Amador County

LIGNITE, near Ione, recently tested by Bureau of Mines, reported to yield 62 gal. of oil per ton and 18 lb. ammonium sulphate; 31% volatile matter and 16% fixed carbon; heating value, 6060 B.t.u. Many similar lignite beds in California, but commercial value unattractive on large scale so far.

Inyo County

R. & S. SILVER (Bishop)—Near Queen, said to have 125 tons ore ready for shipment.

NATURAL SODA (Keeler)—Work resumed with 100 men. Reported work will be resumed by other operators on Owens Lake.

Sierra County

ELDORADO-WISCONSIN (Alleghany)—Incorporated in Nevada to option and develop Eldorado mine. Same incorporators, John Backlin and Thomas Flynn, operate Mariposa. New hoist to be installed.

PRIMROSE (Sierra City)—Optioned by Matzene interests, of Syracuse, N. Y. Good prospects, but mine is not fully developed.

BRUSH CREEK (Mountain House)—Optioned by S. A. Hendricks and associates, of Milwaukee, Wis.

Siskiyou County

FAIRVIEW (Dunsmuir) — Incorporated by W. E. Estes and associates. Main office at Dunsmuir. To reopen mine in eastern edge of county near Minersville. Former producer.

Tuolumne County

EXCELSIOR (Confidence)—Optioned by Sledge and Crosson. To reopen immediately. Former producer.

NATIONAL GOLD MINES CO. (Groveland)—Incorporated in South Dakota, to option and develop four claims near Priest Station. Price, $20,000. Owned by Jesse Mangante and associates. Will deepen 250-ft. shaft to 500 ft., install new boarding house, machinery and small mill. Constructing new road now.

GOLD DREDGE PLACER (Jacksonville)—Fifty acres purchased of G. W. Bates, of La Grange, by A. G. Chatom, of Turlock. Formerly owned by E. A. Wiltsee, of San Francisco.

ELLIOTT (Jamestown)—Good ore at 75-ft. depth in new shaft. Nine men employed. Wayne Rudy, superintendent. Large amount gold produced from this vein by Mexicans in early days.

CARLOTTA - PENNSYLVANIA (Tuolumne)—To install cyanide plant to treat ore crushed in 7-stamp mill. Pennsylvania shaft to be deepened to 500 ft.; 15 men employed. J. P. Kennah, superintendent.

GRIZZLY (Tuolumne)—New incorporation with $150,000 capital stock to reopen mine and install machinery.

COLORADO

Boulder Co.

VICTORIA (Boulder)—Fourth level advanced recently on vein of high-grade silver ore, for 80 ft. Oreshoot supposed to be downward extension of rich orebody opened some years ago nearer surface. Winze being sunk in shoot below level. W. S. Garland, of Brockton, Mass., president.

HUMBOLDT (Ward) — New company organized to take over Humboldt and Texas properties. New shafthouse to be built; lumber and equipment delivered. A 100-hp. boiler and hoist being installed; shaft unwatered to 350-ft. level; compressor plant and machine drills ordered. The 350 level will be advanced from bottom of shaft to develop Grand View property. C. J. Walters, manager.

WHITE RAVEN (Ward)—Winze sunk to 900 level below tunnel; commercial silver-lead ore opened. Two carloads shipped to Boulder Ore Sampling Co. since Apr. 1.

IDAHO

Shoshone County

AMAZON-DIXIE (Wallace)—Station and sump being cut on 1100 level and new pump being installed. Crosscut on this level 335 ft. to south vein. Drifting 60 ft. shows considerable lead-silver and copper ore, which will be further explored at once. Another crosscut being run on this level to north vein, now advanced 300 ft., will cut vein in 100 ft. further. Situated just across Montana line. Controlled by Cleveland men.

BIG CREEK (Wallace)—G. Scott Anderson, manager, announces steps being taken to build 60-ton mill. Ore, lead-silver, running high in latter, and also gray copper. Has been shipping for several years, first under lease and now under company operation. Shipping product sorted and hand jigged. Two miles to railroad.

SUNSHINE (Wallace)—Owns large group of claims on Beaver Creek, where large body lead-silver and zinc ore exposed. Arranged to crosscut from old Roy tunnel, from which 300 ft. will cut ore at further depth of 500 feet.

KANSAS

Cherokee County

BLUE MOUND (Baxter) — Completed north field shaft, but will use only for air for present. Now using 16 mules underground. Operating double shift at both mill and mine; also double shift at Blue Diamond mill, on adjoining acreage.

LUCKY JEW (Baxter)—Contracted for 400-ton concentrator on lease northwest of U. S. Smelting Co. No. 2 mine.

LIBERTY M. & M. (Galena)—Starting shaft sinking on tract in entirely new territory west of Lowell, Kan. Drilling showed ore deposits at 190 to 250 ft. If development favorable, a new field will be introduced.

MICHIGAN

Gogebic Range

NEWPORT (Ironwood)—Main drift 25th level advancing 50 to 60 ft. per week, driven by two eight-hour shifts. About 200 ft. from "K" shaft crosscut and still in ore.

STREET RY. (Ironwood)—Is constructing 700 ft. of track in new location. Old line to Jessieville abandoned on account of mining operations.

Menominee Range

BUREAU OF MINES RESCUE CAR No. 7 will be on range for several weeks; at Niagara, week ending May 11; at Iron Mountain, week ending May 18; at Norway, week ending May 25.

MINNESOTA

Cuyuna Range

FEIGH (Ironton)—Development about completed and shipping of first ore to begin soon. Modern equipment, including electric hoist. Property of Hanna Ore Mining Company.

HUNTINGTON AND MARTIN (Ironton)—Installing electric locomotives for underground haulage.

PENNINGTON (Riverton)—Beginning shipments May 1. First cargo completed May 7.

Mesabi Range

GRACE (Chisholm)—Completed shipment of stockpile. Property worked out and surface plant and pumps removed. Inland Steel Co., operators.

HAROLD (Hibbing)—Conducting extensive experiments with loading machines.

WEBB (Hibbing)—Working day shift only. Night crew laid off. Started direct shipments from shaft. Washing plant idle.

EMMET (Virginia)—Being reopened by Bowe-Burke Co., contractors. Will be on shipping list this season.

MISSOURI

Joplin District

CIRCLE (Oronogo)—Sidney Wilkins resigned as manager, and A. J. Burnham, of Webb City., Mo., who formerly managed this property, reëmployed. Circle plant, owned by Connecticut Zinc Corporation, represents nearly a million dollar investment, but has produced little concentrate during the last six months, though the new mill, largest in district, has been ready for operations.

MONTANA

Lewis and Clark County

HELENA (Helena)—Cruse Consolidated drifting north-south on 400 level. Vein showing better, with higher grade than above in silver contents

LIBERTY (Silver Camp)—Mike Horse Co., in Spokane, reorganized under name of Liberty. Mike Horse vein in Silver Camp shows good orebody, and 150-ton mill in place. Mining and milling silver-lead-zinc ore.

Powell County

MONARCH (Elliston)—Operations carried on at Bison Mountain, where Monarch mine is situated. Mill and power plant to be constructed.

NIGGER HILL (Elliston) — Several quartz properties under operation on Nigger Hill include Black Jack and Big Dick.

UNCLE BEN PLACERS (Marysville)—Hydraulic and ground sluicing begun in Uncle Ben Gulch, west of Marysville.

NOLAN (Ophir)—Shipment silver ore from vein opened by crosscut.

Silver Bow County

BUTTE & SUPERIOR (Butte)—April production 8,250,000 lb. zinc in concentrates and 150,000 oz. silver, as compared with 7,250,000 lb. zinc and 135,000 oz. silver in March. Mined 29,000 tons ore, and recovered 7500 tons concentrates 55% zinc. Mill heads averaged 15% zinc; mill recovery averaged 96%. No. 2 shaft, being raised out from 2050-level to the 1900, will require about a month, then sinking will start. Angus McLeod, superintendent.

DAVIS-DALY (Butte)—Blocking out high-grade ore preparatory to increasing tonnage when copper market warrants. Chief work at Colorado mine. Enlarging 2500-station to make ready for sinking to the 2700. Only ore being shipped that from development work, which is paying all expenses and affording sufficient to carry on surface improvement program. Monthly average copper content has been above 8%. William Frazi superintendent.

EAST BUTTE (Butte)—April output, 1,347,580 lb. copper, 47,771 oz., silver, as compared with 1,717,230 lb. copper and 53,650 oz. silver in March. Operating from 60 to 70% of normal. Chief work is development of 1800 level of Pittsmont mine. A. G. Ray, superintendent.

NORTH BUTTE (Butte)—April production 620,800 lb. copper; 27,338 oz., silver; 38 oz., gold. Operating less than 50% of normal. No stoping of ore, rock shipped being that broken in development. Working out bonus system as measure to promote efficiency. Results thus far show about 30% improvement. Lester Frink, superintendent.

NEVADA

Lincoln County

PIOCHE DISTRICT ore shipments for week ended May 1 were: Prince Consolidated, 25 cars; Virginia-Louise, 7 cars.

STELLA, in Comet district, is shipping high-grade silver ore. Second carload in transit to smeltery; third awaiting shipment.

Nye County

TONOPAH SHIPMENTS for week ended May 3 totaled 7335 tons, of estimated milling value $124,695. Shippers were: Tonopah Belmont, 2238 tons; Tonopah Mining, 1050; Tonopah Extension, 2100; West End, 890; Jim Butler, 222; Montana, 73; Tonopah Divide, 420; MacNamara, 210; miscellaneous, 32 tons.

IN DIVIDE DISTRICT among properties sinking, installing machinery or preparing for development work at depth are the Reno Divide, High Divide, Ajax Divide, Gold Wedge, Rosetta, Emancipator, Gold Reef, Gold Seam, Belmont, Charter, Silver Divide, Grimes, Verdi, Victory, Mohawk, Florence, Allied, Revert, Ben Hur, Divide Syndicate, Junior, Silver King, North, Annex, Apex, Smuggler, Keystone, Argentine, Hasbrouck Divide, Liberty, Calumet, Big Divide, Central, Wilson, Divide City Mining, Jim's Divide, Mizpah, Rand, Treadwell, Goldsmith, Eureka, Kendall, Crown, Gold Bank, Horseshoe, Marne, Sunbeam, Doctor, Toggery, Northwestern, Mighty, Belcher, Liberty Bell, Operator, Midway, Pyramid, Rosalind, Pershing, High Divide Extension, Allied Divide Extension, Sutherland Extension, Ben Hur North Extension, Hercules, Aztec, Old Timer, Giant, South Divide, Congress, Bullion, Bevis, Union, Chariot, Kernick, Standard, Argonne, Rainbow, Lookout, American, Wonder, Champion, Comstock, Vindicator, Homestake,

Brooklyn, Mecca, Airedale, Albany, Hecla, St. Patrick, Buckskin, Gold Mountain, Great Divide, Klondyke, Yukon, Lucky Boy, New Divide, West Divide, Pay Divide, Portland, Silver and Gold, Telephone Girl, Crescent, Doughboy, National, Sterling, all with Divide attached to their names. More than 50 companies are financed, with from $20,000 to $100,000 in their treasuries.

SUTHERLAND DIVIDE (Divide)—Machinery in operation; 400-ft. incline shaft repaired and timbered and will be sunk 200 ft. deeper while drifts and crosscuts are extended on 300 and 400 levels. Shipped good ore in the past.

TONOPAH HASBROUCK (Divide)—Ore from vein opened in main tunnel, 400 ft. from portal, shipped to Tonopah. Tunnel advanced 950 ft.; cut main lode of the mountain through property for long distance, and yielding good assays at surface, showing ore carrying free gold. Shaft, collar of which is 60 ft. below tunnel level, is 360 ft. deep and has been retimbered. Old workings at 200 level being reopened. Foreman in charge under John McKane, in 1904, has returned and says vein was developed at this depth by drift and crosscuts at 50-ft. intervals for 750 ft. McKane, ho was associated with Charles M. Schwab, abandoned work on Hasbrouck because of larger interests in Tonopah and Goldfield. George Kernick bought and worked the Hasbrouck mine, shipping 1000 tons from the tunnel, leaving in sight 3000 tons to be shipped now while opening the lower levels.

STAR OF THE WEST MINING (Gazette Bldg., Reno)—Recently incorporated, having taken over Nevada Mining Co. property, consisting of three patented claims and mill sites. Was tied up in litigation for years, preventing operations, but prior to that was good gold and silver producer. About a mile of underground workings, deepest being 170 ft. Old mills are obsolete, and new one purchased from Colorado Iron Works to treat 50 tons daily as first unit of new plant. It is intended to erect this unit when weather permits. R. B. Todd, president and manager. Directors: R. J. Withers, John F. Clapisson, L. L. Griffiths, who is also consulting engineer. New York office, 1482 Broadway.

NEW MEXICO

Grant County

ORGAN ORE (Lordsburg)—Chartered, capital $50,000, $6000 paid in. L. B. Bently, Organ, N. M.; W. W. Cox, D. Isaacs, V. B. May, C. T. Seale, of Las Cruces, directors.

BOSTON HECLA (Lordsburg)—To sink shaft and erect buildings, excavations for which are complete.

BUFFALO OIL AND GAS (Lordsburg)—Incorporated by local men for $250,000, with $2000 paid in. Will drill for oil. Control 5000 acres oil locations in vicinity.

DEMING OIL, GAS AND DEVELOPMENT (Lordsburg)—Preparing to drill for oil, 15 miles west. Have 4000 acres oil locations.

JACK STEVENS (Lordsburg)—Preliminary work has started on this ground at Gold Hill looking to permanent lease if conditions justify.

LAST CHANCE (Lordsburg)—Shipping 25-ton car silver concentrates to El Paso smeltery, contents valued approximately $25,000. J. Shottwell, superintendent.

MONTE RICO (Lordsburg)—Litigation between Boyd and stockholders decided in Federal court in St. Louis in favor of Boyd. Work will be started when plant, idle three years, is repaired. Tunnel will be extended 175 ft. to cut Lee's Peak dike. Howard Boyd, superintendent.

OCTO (Lordsburg)—E. K. Davis, general manager, in charge, states work will start soon.

SOUTH DAKOTA

Lawrence County

CUTTING (Deadwood)—New two-compartment shaft gained depth of 200 ft.; 500 ft. to be driven before lateral work started.

Pennington County

NATIONAL TIN (Hill City)—Formerly American Tin Co. Work resumed, and Cowboy Shaft will be sunk additional 500 ft. Alexander Roy, of New York City, appointed general manager.

SUMMITT (Oreville)—Sold to John R. Bland, of Custer, who has started work. Regular copper shipments will be made to smelter. Occurs as chalcocite. To be hand sorted.

TEXAS

Brazoria County

WEST COLUMBIA field showing decrease in production. Several wells have stopped flowing. Decrease in gas pressure due to blowout at Hogg well No. 15 thought responsible. Salt water has appeared in field.

ROXANA PETROLEUM abandoned No. 4 Seaburn well at about 1400 ft., and Freeport Sulphur Co. its No. 1 Dannembaum & Tolar at 1335 ft. Both wells, on Stratton Ridge, were abandoned in salt.

WEST COLUMBIA average daily production for week ended Apr. 22 was 18,363 bbl., as follows: Crown Oil and Refining Co., 2480 bbl.; the Texas Co., 6116 bbl.; Humble Oil and Refining Co., 7845 bbl.; Gulf Productions Co., 1887 bbl.; Hannicker Oil Co., 35 bbl. Production decreased on account of two wells temporarily shut off.

CROWN OIL AND REFINING (West Columbia)—Storing product here. Planning to build barge channel to Pasadena on Houston ship channel. On refinery site here steel tanks will be built for overflow production until refinery completed.

Concho County

SCHULTZ OIL CO. (Paint Rock)—Well No. 2, eight miles south of town, struck oil sand at depth of 3100 ft.; oil showing good, and no water in well. First well of this depth in county.

Harris County

RECENT COMPLETIONS IN HUMBLE FIELD are: Deep Sand Co.'s No. 1 W. & P., salt water at 1640 ft.; Earnings Oil Co.'s No. 1 Long, salt water at 1215 ft.; Gulf Production Co.'s No. 8 Busch, pumping 50 bbl. at 900 ft.; Hancock Oil Co.'s No. 7 Bender, abandoned at 1188 ft.; Invincible Oil Co.'s No. 17 Cherry, abandoned at 1150 ft.; the Texas Co.'s 235 Landslide, bailing at 2968 ft.; No. 175 Hermann and 26 Koehler bailing, and No. 1 Bready pumping 10 bbl. at 610 ft.; Crown Petroleum Co. bailing No. 1 Bailey and setting strainer at 1190 feet.

FREEMAN LEASE (Goose Creek)—Well No. 2, of Warren Estate, Chicago, came in Apr. 21 as strong gusher. In bay between Hog Island and Atkisson Island.

DEEP BLUE RIDGE OIL CO. (Houston)—Capitalized for $1,500,000. To prospect for oil and operate leases in south Texas, especially Blue Ridge section. Incorporators, C. H. Lane, W. C. Hardcastle and T. T. Pendleton.

Liberty County

EMPIRE GAS AND FUEL CO. (Dayton)—Well No. 2 completed at 1200 ft. Now standing full of water to within 200 ft. of top. Considerable gas escaping. New strainer set, and well expected to pump 400 bbl. per day.

Matagorda County

TEXAS GULF SULPHUR (Gulf)—New $4,000,000 sulphur plant recently in operation and contracted for construction of large storage bins and other facilities to make Texas City the deep-water shipping port for its product. Now producing 1200 tons daily; to be increased by drilling additional wells. Expects to ship over 200,000 tons raw sulphur yearly, a large amount going to South America and Europe.

UTAH

Juab County

TINTIC SHIPMENTS for April, 597 cars, estimated at 29,500 tons, valued at $900,000, as compared with 584 cars in March and 590 cars in February. Total by Tintic in last four months about 100,000 tons, valued at over $3,000,000. Twenty-four shippers in April.

IRON KING (Eureka)—Expected to ship iron ore for fluxing as soon as railroad is completed. Shaft already down considerable distance to be sunk to prospect for continuation of Tintic Standard ore. Upper part being retimbered. Grading being done on surface for foundations to new gallows frame, hoisting engine and other equipment.

LEHI TINTIC (Eureka)—Tunnel driven for better air in 1800 ft.; connections to be made soon with main workings.

Salt Lake County

ROAD UP LITTLE COTTONWOOD CANYON open from Wasatch as far as Tanner's Flat. Hauling season to open soon.

COLUMBUS-REXALL (Alta)—Ore in new raise driven near old stopes making out into bedding. Importance not yet determined. Several cars second-class ore ready for shipment. Snow covering spur to narrow-gage road melting.

UTAH IRON AND STEEL (Midvale)—Plant, down about two months, again operating. Employs about 250 men.

Summit County

PARK CITY SHIPMENTS FOR APRIL, according to preliminary figures, 6425 tons of ore and concentrates. Shippers were: Judge Mining and Smelting, 1882 tons; Silver King Coalition, 1818; Ontario Silver, 1800; Daly Mining, 205; Daly West, 165; Silver King Consolidated, 55; miscellaneous, 500 tons. March output, 7984 tons. First four months 1919, about 35,000 tons, valued at $2,000,000.

SILVER KING COALITION (Park City)—Large hoisting plant at main shaft to be electrified. Other changes made to facilitate production. Shipped 1,317,600 lb. ore and concentrates week ended May 3.

CANADA

British Columbia

CANADA COPPER CORPORATION'S NEW MILL now under construction in the Princeton district, being hurried to completion in order to begin milling early in summer. Situated on Copper Mountain. Initial mill capacity to be 2000 tons daily.

CONSOLIDATED MINING AND SMELTING CO., in Princeton district, has acquired Voight copper group, on Copper Mountain, and has put large crew working on development.

Ontario

BAILEY (Cobalt) — Shareholders, by large majority, voted in favor of merger with Northern Customs Concentrator, Limited.

BEAVER (Cobalt) — Struck 3-in. vein of high-grade on 600 level.

CAMPBELL & DEYELL, Ltd. (Cobalt)—Customs sampling plant taken over and will be operated under same management, by T. & N. O. Ry. Commission. With decrease in output of high-grade from Cobalt mines, and higher operating costs, old company unable to operate at profit, and decided to close down. Plant of much benefit to northern Ontario and Railway Commission decided to operate.

MINING CORPORATION (Cobalt)—Will prospect the conglomerate Keewatin contact in Bucke Township by diamond drill. Overburden is heavy and surface prospecting practically impossible.

PETERSON LAKE (Cobalt)—Resumed treatment of Seneca-Superior tailings in flotation mill.

SILVER-CLIFF (Cobalt) — Leased to Northern Customs Concentrator, Limited.

TOUGH-OAKES (Kirkland Lake)—In April did 1000 ft. of underground work. Opened up new orebody on 300 level.

BURTON-MUNROE (Matheson) — Resumed operations.

HOLLINGER (Porcupine) — Treating 2300 tons ore a day.

INSPIRATION (Porcupine)—To be prospected with diamond drill.

SCHUMACHER (Porcupine)—No definite date yet set for dewatering Schumacher mine and beginning operations.

MEXICO

OIL CONCESSIONS have been granted to a Japanese commission, headed by Baron Hasegawa, captain of engineers, for exploration purposes in the northern part of the country, particularly in Durango and Chihuahua, according to a statement of the Department of Industry and Commerce. The commission has completed an investigation of the petroleum possibilities in the Tampico region.

Coahuila

COAL MINES of this state resumed operations, producing 40,000 tons coal monthly, being about one-half normal production, and 18,000 tons coke, being about one-third normal production.

Durango

JAPANESE STEEL INTERESTS reported to have leased mountain of iron ore at city of Durango, formerly owned by Honey Syndicate. Modern steel plant in vicinity reported as part of plans.

Sonora

QUINTERA (Alamos)—Has record of 20,000,000 oz. refined silver. Owned by French syndicate, under option through S. L. Pearce. Claimed to have 20,000 tons workable ore on dumps.

GREENE CANANEA (Cananea)—April production was 3,000,000 lb. copper, 1,131,433 oz. silver, 1730 oz. gold.

The Market Report

SILVER AND STERLING EXCHANGE

May	Sterling Exchange	Silver New York, Cents	Silver London, Pence	May	Sterling Exchange	Silver New York, Cents	Silver London, Pence
8	4.6788	103	48⅜	12	4.6850	119½	58
9	4.6825	105⅜	53½	13	4.6875	114⅜	55½
10	4.6850	111	58	14	4.6775	111	54

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

May	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
8	15⅜	†72½	4 75 @4.85	4.55 @4.60	5.95
9	15⅜	†72½	4.75 @4.85	4.57½ @4.62½	5.97½
10	15⅜	†72½	4.75 @4.85	6.62½ @4.67½	5.97½
12	15.40 @15.45	†72½	4.90 @5.00	4.62½ @4.67½	5.97½
13	15.60 @15.70	†72½	5.00	4.70	6.00
14	15.70 @15.80	†72½	5.00	4.70	6.02½

† Government price.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

May	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
8	76½	76¾	80	229	228½	24⅛	24⅜	34⅜
9	76¾	77	80	231	229	24	24⅛	34⅜
10								
12	76½	76½	80	236	233	24	24⅛	34⅜
13	76½	77⅛	80	235	232½	24⅛	24	35⅛
14	77⅛	77½	81	236	233	24⅛	24⅛	35

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

NEW YORK—May 14, 1919

The chief event of this week was the spectacular rise in the price for silver, which was 103 on Thursday, 105¾ on Friday, 111 on Saturday, and 119¾ on Monday. On Tuesday the market became reactionary, the official quotation being 114⅜, and today it is down further. London was a bidder for silver in this market and was immediately responsible for the advance. There were wide variations in prices between morning and afternoon of each day. The official prices that we quote are usually published about noon, but during the last week have been delayed until later in the day, tardiness in the receipt of the London cables being responsible for this. American producers of silver were able to sell little, if anything, at the high price that was named on Monday. Several reported inability to make sales. The sharp advance is attributed to a speculative squeeze in the spot position in London.

Besides the rise in silver there was a sharp advance in copper, on large business, a marked improvement in lead, and a slight improvement in zinc. There was a better tone all around, which, no doubt, to some extent reflected the bull market in Wall Street.

Transatlantic freights remain unchanged at 1c. per lb. to British ports and 1½c. to French ports. The rates from San Francisco to Japan and China remain unchanged at $15 per ton.

The stocks of metals held by the British Munitions Ministry on May 1, (with corresponding figures for Apr. 1 in parentheses) were as follows: Copper, 114,531,200 lb. (109,092,480); lead, 244,186,880 lb. (216,061,440); spelter, 76,090,560 lb. (85,225,280); aluminum, 25,854,080 lb. (49,772,200); nickel, 5,750,080 lb. (5,351,360); antimony, 9,992,640 lb. (9,768,640.)

Copper—A large business was done at steadily advancing prices. Beginning with Thursday all producers were willing to sell at 15½c., regular terms. There was a substantial demand, and some producers whose sales in previous weeks had not been quite satisfactory were able to place such large quantities that on Friday afternoon one of them raised its price to 15¾c., regular terms. Another followed on Saturday morning, but up to the close of business on Saturday there were still sellers on a large scale at 15½c., regular terms. On Monday, however, everybody went up, although not immediately, to 15¾c. On Tuesday that price was firmly established, and by the end of the day 16c. was being asked in some quarters, but the market has not yet become established on that basis, although that price would have to be paid for July delivery. May-June copper sold today at 15¾c., regular terms.

While the transactions of the week foot up to a large figure, especially considering that they were mainly confined to domestic business, the larger part of the business was done in the earlier days of the week at the 15½c. level. In the later days, although there was some strong buying, more conservatism began to be exhibited. As in previous weeks, wire-drawers were the chief buyers, but some substantial business was done with brass-makers. Speaking generally, however, the brass-makers are not in a happy state of mind. The buying of this week was mainly for May-June delivery, but some contracts were entered into for July delivery. However, the latter constituted only a small proportion of the total.

Copper Sheets—The base price of copper sheets is 23c. per lb. Copper wire is quoted at 17⅛@17⅜c. per lb. f.o.b. mill, carload lots.

Tin—There is nothing much to report. The stock held by the U. S. Steel Products Co. is being taken very slowly by consumers, and instead of its being absorbed by the middle of June, the present forecast is for early in July, while some people think that it may be Aug. 1 before news is published that all has gone.

Lead—Lead manufacturers report improving business, especially for such articles as are required in house building. Producers experienced a better demand and stiffened their prices accordingly. During the last two days of the week a considerable tonnage of lead for prompt shipment from the West was sold at 5c., New York. The disposition of the Government's stocks ceased to be so much of a worry.

Zinc—Not much interest on the part of consumers was reported, but there was considerable speculative buying, which led to an advance in prices. However, there does not appear to be anything in sight of a nature to inspire enthusiasm.

High-grade zinc, 99.9%, sold this week on terms corresponding to 6¼c., St. Louis.

Zinc dust of the ordinary prolong grade is available at 9c.

Japan inquired for spelter in this market, but ideas as to price were far below our existing level.

Arrangements for handling the Government's stocks have not yet been consummated.

Zinc Sheets—The quoted price of zinc sheets is $11 per 100 pounds.

Other Metals

Aluminum—Nominal at 33c.

Antimony—This market was again somewhat stronger, a fair business being done from day to day. We quote spot at 7@7¼c., and futures at 7c.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.20 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.40 per lb. in lots of 500 pounds.

Nickel—Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—The New York price is quoted at $80, but sellers are not keen about accepting that price, and some small sales are reported as having been made at $82@83. A short supply on hand in this market is the reason for the strength. San Francisco telegraphs $75, steady.

Gold, Silver and Platinum

Gold—All manufactures of gold the bullion value of which does not exceed 65% of the total value can now be exported without individual export licenses.

Silver—The silver market has been in an excited condition the last week, owing to the removal of Government restrictions on price and export licenses by both the Federal and British governments. As a result the price made the phenomenal advance of about 20c. per oz. on May 9 and May 10, due to the urgent demand of buyers in London on a market short of supplies. The accumulated demands from various buyers for coinage and commercial purposes which had not been filled owing to Government restrictions were thrown on the market for immediate purchase, and as sellers were inclined to hold off, the result was the forcing of the price too high, and buying orders were canceled. With sellers pressing for sale, a natural reaction has occurred, and the market closes weak and lower. India and China have not been buyers at the advance, and it seems probable that, after the filling of these special orders, the market will settle down to the basis of the nominal India demand, with fluctuations depending on market conditions.

Pixley & Abell report in their circular of Apr. 24 that there are now in Shanghai 28,600,000 taels of sycee and 18,400,000 Mexican dollars.

Mexican dollars at New York: May 8, 79; May 9, 80; May 10, 84; May 12, 89; May 13, 87; May 14, 85.

Platinum—We quote refined ingot at $100. Demand continues good.

Palladium—We quote $118@120.

Zinc and Lead Ore Markets

Joplin, Mo., May 10.—Blende, per ton, high, $39.80; basis 60% zinc, premium grades, $37; Prime Western, $36@35; sludge and flotation, $34@30; Calamine, basis 40% zinc, $25@22. Average settling prices: Blende, $36.44; calamine, $24.12; all zinc ores, $36.

Lead, high, $61.75; basis 80% lead, $56@55; average settling prices, all grades of lead, $52.75 per ton.

Shipments the week: Blende, 9295; calamine, 359; lead, 2566 tons. Value all ores the week, $482,790.

Failure to effect concerted action for controlling the zinc-ore output caused an overproduction, bringing prices to a level that threatens disaster to zinc mining. Mine after mine is being quietly closed down, and the pumps are being stopped. Where the present depression will end is problematical, but it cannot stop until a steady appreciation of prices warrants operation of the mines.

Platteville, Wis., May 10.—Blende, basis 60% zinc, $38 base both for premium grade and high-lead grade.

Lead ore, basis 80% lead, $53 to $54 per ton.

Shipments reported for the week are 2029 tons blende, 107 tons galena, and 1291 tons

sulphur ore. For the year to date the totals are 35,780 tons blende, 1827 tons galena, and 3902 tons sulphur ore. During the week 2557 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Ore of 45% or over is reported offered at $26 per ton, f.o.b. San Francisco.

Molybdenum Ore—No business reported.

Manganese Ore—No important business, that we hear of, is being done.

Tungsten Ore—A little business in Chinese ore was done at $6.50@7. More inquiries from Europe are reported.

Pyrites—Spanish pyrites has been sold at 20½c. per unit for furnace ore, c.i.f. New York or any South Atlantic or North Atlantic port.

Iron Trade Review

PITTSBURGH—May 14

While the dissolution of the Industrial Board last Friday does not directly affect the steel market situation, since the board's effort to control the situation had been proved ineffectual weeks ago, the dissolution is likely to have a beneficial effect upon sentiment generally, making buyers and sellers more anxious to get together. Only after Secretary Redfield had accepted the resignations of the members of the board, tendered late in April, did it come out that on Apr. 1 the Attorney General had rendered an opinion that the whole operation was illegal, and thus in no circumstances could the program have been carried out according to the original plan. Doubtless Judge Gary knew of this decision of the Attorney General when on Apr. 21 he occasioned such surprise by stating at the annual meeting of Steel Corporation stockholders that he understood the Industrial Board plan had been "abandoned entirely."

The estimate made in this report a week ago, that the steel industry was then running at somewhat under 60% of capacity, is confirmed by the monthly report of the American Iron and Steel Institute, which shows that during April the mills ran at an average of 65% of capacity, this comparing with 77% in March, 85% in February and 87% in January. As the decrease in operations was steady, it may be assumed that the rate was a trifle over 70% Apr. 1, 65% Apr. 15 and a trifle under 60% May 1. This week the rate is probably about 55%. Two or three large independents are known to be running at between 40 and 45%, but the Steel Corporation is averaging above 60%. This divergence may influence some independents to cut loose from the fixed schedule of steel prices, because of their costs being increased by the light operation, with poor distribution of overhead.

PIG IRON

Pig Iron—Rumors are increasing of price shading in the local market, but precise prices cannot be secured, and the market generally is quotable at the prices effective Mar. 21, though quite weak at those prices: Bessemer, $27.95; basic, $25.75; malleable, $26.25; foundry, $26.75; forge, $25.75, f.o.b. Valley furnaces, with $1.40 freight to Pittsburgh. One furnace interest, however, with freight to Pittsburgh 30c. less than the Valley rate, is willing to sell f.o.b. furnace at these prices, representing a saving of 30c. to Pittsburgh buyers.

STEEL

Steel—Inquiry for billets and sheet bars is extremely limited. Full prices, $38.50 for billets and $42 for sheet bars, are being quoted, except for commissions to middlemen which are too small to justify the dealer splitting with the consumer.

FERROMANGANESE

Ferromanganese—It is reported that a small lot of re-sale 80% ferromanganese has gone at $105, delivered, but the market generally seems quotable as a week ago, $110@115, with the furnaces still quoting $150 as their price. Resale 18% spiegeleisen remains quotable at $33@35 delivered, but there has not been enough demand to test the market.

COKE

Coke—The spot market is again stiffer, the lower price sellers having quit, while the recent purchases of about 10,000 tons by the Jones & Laughlin Steel Co., because of labor trouble at the coal mine supplying its own coke works, at $3.50, have had an influence. Spot coke cannot be had below $3.75, and quotations run up to $4, which was the common settling price for May deliveries on contracts calling for monthly price adjustment. The market is now likely to remain steady until negotiations begin for second half, as many contracts expire June 30. Negotiations will likely start by furnaces bidding about $3.50 for second half. Spot foundry coke remains at $4.25@5, depending on brand, with no contract market developed.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.125	36.682	44.356	48.438
Feb.	77.585	85.716	101.125	37.742	42.792	48.027
Mar.	73.861	88.082	101.125	36.410	43.620	48.171
April	73.875	95.346	101.125	36.963	47.215	48.886
May	74.745	99.505	.....	37.940	48.980	.....
June	76.971	99.500	.....	39.065	48.875	.....
July	79.010	99.625	.....	40.110	48.813	.....
Aug.	85.407	100.292	.....	43.418	49.077	.....
Sept.	100.740	101.125	.....	50.920	49.500	.....
Oct.	87.332	101.125	.....	44.324	49.500	.....
Nov.	85.891	101.125	.....	43.584	48.969	.....
Dec.	85.960	101.125	.....	43.052	48.492	.....
Year	81.417	96.772	.....	40.851	47.516	.....

New York quotations cents per ounce troy, 999 fine London, pence per ounce, sterling silver, 925 fine.

Copper	New York Electrolytic		London Standard		London Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	16 763	110.000	78.700	125.000	95.700
Mar.	23.500	14 856	110.000	76.821	125.000	82.071
April	23.500	152 46	110.000	77.300	125.000	82.200
May	23.500	.....	110.000	.....	125.000	.....
June	23.500	.....	110.000	.....	125.000	.....
July	25.904	.....	119.913	.....	134.913	.....
Aug.	26.000	.....	122.000	.....	137.000	.....
Sept.	26.000	.....	122.000	.....	137.000	.....
Oct.	26.000	.....	122.000	.....	137.000	.....
Nov.	26.000	.....	122.000	.....	137.000	.....
Dec.	(a)	.....	118.447	.....	133.167	.....
Year	24.628	.....	115.530	.....	130.507	.....

(a) No Market.

Tin	New York		London	
	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557
February	92.000	66.801	311.525	223.963
March	(a)	67.934	318.875	236.843
April	(a)	72.500	329.905	225.275
May	(a)	.....	364.217	.....
June	(a)	.....	331.925	.....
July	(a)	.....	360.347	.....
August	(a)	.....	380.900	.....
September	(a)	.....	343.905	.....
October	(a)	.....	335.543	.....
November	(a)	.....	323.550	.....
December	(a)	.....	267.736	.....
Av. year	(a)	.....	330.138	.....

(a) No average computed.

Lead	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.00	37.227
February	6.973	5.057	6.899	4.784	29.00	28.675
March	7.201	5.226	7.091	4.992	29.00	27.952
April	6.772	4.982	6.701	4.722	29.00	24.888
May	6.818	.....	6.704	.....	29.00	.....
June	7.611	.....	7.511	.....	29.00	.....
July	8.033	.....	7.750	.....	29.00	.....
August	8.050	.....	7.750	.....	29.00	.....
September	8.050	.....	7.750	.....	29.00	.....
October	8.050	.....	7.750	.....	29.00	.....
November	8.050	.....	7.750	.....	31.20	.....
December	6.564	.....	6.324	.....	40.00	.....
Year	7.413	.....	7.222	.....	30.10	.....

Spelter	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.836	7.272	7.661	7.922	54.000	56.045
February	7.814	6.623	7.639	6.273	54.000	46.150
March	7.461	6.500	7.286	6.150	54.000	38.500
April	6.890	6.465	6.715	6.114	54.000	36.118
May	7.314	.....	7.114	.....	54.000	.....
June	8.021	.....	7.791	.....	54.000	.....
July	8.688	.....	8.338	.....	54.000	.....
August	8.985	.....	8.635	.....	54.000	.....
September	9.442	.....	9.092	.....	54.000	.....
October	8.801	.....	8.451	.....	54.000	.....
November	8.491	.....	8.141	.....	54.100	.....
December	8.163	.....	7.813	.....	56.050	.....
Year	8.159	.....	7.890	.....	54.180	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1918	1919	1918	1919	1918	1919
January	$37.25	$33.60	$33.95	$31.40	$33.95	$32.40
February	37.25	33.60	33.95	31.40	33.95	32.40
March	37.25	32.54	33.95	31.40	33.95	29.12
April	36.15	29.35	32.95	27.15	33.95	28.15
May	36.20	.....	33.00	.....	34.00	.....
June	36.36	.....	33.16	.....	34.16	.....
July	36.60	.....	33.40	.....	34.40	.....
August	36.60	.....	33.40	.....	34.40	.....
September	36.60	.....	33.40	.....	34.40	.....
October	36.60	.....	34.40	.....	35.40	.....
November	36.60	.....	34.40	.....	35.40	.....
December	36.60	.....	34.40	.....	35.40	.....
Year	$36.67	.....	$33.70	.....	$34.45	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.† May 13	
Alaska Gold M.	3⅛
Alaska Juneau	2
Am.Sm.&Ref.,com.	79⅛
Am.Sm. & Ref., pf.	109
Am.Sm.Sec., pf., A.	93
Am. Zinc	17
Am. Zinc, pf.	48⅛
Anaconda	67
Batopilas Min.	2
Bethlehem Steel	75
Butte & Superior	25
Butte Cop. & Zinc	13⅛
Cerro de Pasco	45
Chile Cop.	24⅛
Chino	38⅛
Colo. Fuel & Iron	46
Crucible Steel	72⅛
Crucible Steel, pf.	96
Dome Mines	15⅛
Federal M. & S.	19
Federal M. & S., pf.	46
Great Nor., ore ctf.	45⅛
Greene Cananea	40⅛
Gulf States Steel	63⅛
Homestake	‡89
Inspiration Con.	53
International Nickel	2..
Kennecott	34⅛
Lackawanna Steel	75⅛
Mexican Petrol.	181⅛
Miami Copper	25
Nat'l Lead, com.	75
National Lead, pf.	108
Nev. Consol.	17⅛
Ontario Min.	10⅛
Ray Con.	21⅛
Republic I.&S.,com.	84⅛
Republic I.&S., pf.	103⅛
Sloss-Sheffield	58
Tennessee C. & C.	15⅛
U. S. Steel, com.	101⅛
U. S. Steel, pf.	114⅛
Utah Copper	78⅛
Va. Iron C. & C.	63⅛
Worthington Pump	69

BOSTON CURB* May 13	
Boston Ely	1⅛
Boston & Mont.	.69
Butte & Lon'n Dev.	.12
Calaveras	.50
Chief Con.	3⅛
Contact	.05
Corbin	‡.25
Cortez	.12
Crown Reserve	.35
Crystal Cop.	.17
Eagle & Blue Bell	2⅛
First Nat. Cop.	1⅛
Gadsden Cop.	3
Houghton Copper	.40
Intermountain	‡.05
Iron Blossom	.40
Iron Cap	10⅛
Majestic	.18
Mexican Metals	.15
Mines of America	‡.05
Mojave Tungsten	.13
Nat. Zinc & Lead	.13
Nevada-Douglas	.18
New Baltic	1⅛
Oneco	.30
Pacific Mines	1‡.25
Rex Cons.	.14
Yukon Gold	.76

SAN FRAN.* May 13	
Alta	‡ .08
Andes	.39
Best & Belcher	.35
Caledonia	.24
Challenge Con.	‡.03
Confidence	.25
Con. Virginia	2.70
Gould & Curry	.12
Hale & Norcross	.26
Jacket-Cr. Pt.	.25
Mexican	.62
Occidental	.40
Ophir	2.00
Overman	.10
Savage	.19
Sierra Nevada	.19
Union Con.	.40
Utah Con.	‡.04
Belmont	3.50
Jim Butler	.44
MacNamara	1.15
Midway	.51
Mont.-Tonopah	.25
North Star	.10
Rescue Eula	.24
West End Con.	2.62⅛
Atlanta	.04
Booth	.13
Comb. Frac.	.07
Florence	.45
Jumbo Extension	.14
Kewanas	.04
Nevada Hills	.07
Nevada Packard	.19
Round Mountain	.30
Silver Pick	.09
White Caps	.23

COLO. SPRINGS* May 13	
Cresson Con.	4.50
Doctor Jack Pot	.03
Elkton Con.	.05
El Paso	.18
Gold Sovereign	‡.02
Golden Cycle	1.79
Granite	.14
Isabella	.05⅛
Mary McKinney	‡.07⅛
Portland	.95
United Gold M.	.16⅛
Vindicator	.30

BOSTON EXCH.† May 13	
Adventure	‡.50
Ahmeek	.73
Algomah	.75
Allouez	37⅛
Ariz. Com.	12⅛
Arnold	‡.20
Bingham Mines	10
Bonanza	‡ 10
Butte-Balaklava	.65
Calumet & Ariz.	62
Calumet & Hecla	380
Centennial	12
Copper Range	44⅛
Daly West	3⅛
Davis-Daly	6⅛
East Butte	10⅞
Franklin	2
Granby	‡66⅛
Hancock	5
Hedley	‡12
Helvetia	3⅛
Indiana	.50
Isle Royale	26⅛
Keweenaw	‡1⅛
Lake	4⅛
La Salle	‡2⅛
Mason Valley	2⅛
Mass	5⅛
Mayflower	6⅛
Michigan	5
Mohawk	58⅛
New Arcadian	2⅛
New Cornelia	18⅛
New Idria	8
Nipissing	13⅛
North Butte	11⅛
North Lake	.60
Ojibway	‡ ⅛
Old Dominion	34
Osceola	48⅛
Quincy	60
St. Mary's M. L.	49
Santa Fe	‡.25
Seneca	20
Shannon	2⅛
Shattuck-Ariz.	‡11
So. Lake	1⅛
So. Utah	.18
Superior	5
Superior & Bost.	2⅛
Trinity	⅞
Tuolumne	‡.81
U. S. Smelting	68⅛
U. S. Smelting, pf.	49⅛
Utah Apex	2
Utah Con.	9⅛
Utah Metal	2
Victoria	2⅛
Winona	1⅛
Wolverine	18⅛

N. Y. CURB† May 13	
Am. Tin & Tung.	‡
Big Ledge	⅛
Butte & N. Y.	.50
Butte Detroit	‡.04
Caledonia	.39
Calumet & Jerome	‡⅛
Can. Cop. Corpn.	2⅛
Carlisle	‡..
Cashboy	.11
Con. Ariz. Sm.	⅛
Con. Coppermines	5⅛
Goldfield Con.	‡.18
Goldfield Merger	‡.05
Hecla Min.	5⅛
Howe Sound	‡3⅛
Jerome Verde	‡1⅛
Louisiana	‡⅛
Magma	31
Marsh	.10
McKinley-Dar-Sa.	.62
Milford	‡.75
Mother Lode	.41
Nixon Nevada	.23
Ohio Cop.	‡.50
Rawley	‡2⅛
Ray Hercules	2⅛
Richmond	‡.50
Rochester Mines	.22
St. Joseph Lead	‡13
Standard S. L.	‡⅛
Stewart	.24
Success	‡.05
Tonopah	4
Tonopah Divide	10⅛
Tonopah Ex	3⅛
Tribullion	‡ 25
Troy Arizona	‡..0
United Eastern	4⅛
United Verde Ext.	‡36⅛
United Zinc	‡⅛
Utica Mines	‡.08

TORONTO* May 13	
Adanac	.24
Bailey	.03
Beaver Con.	.45
Chambers Feriand.	‡.10
Coniagas	2.00
Hargraves	.05
Kerr Lake	5.75
La Rose	‡.37⅛
Lake Shore	.93
Min. Corp. of Can.	2.00
Peterson Lake	.09
Teck-Hughes	.18
Temiskaming	.40
Wettlaufer-Lor.	.03
Davidson	‡.68
Dome Exten.	.32
Dome Lake	.23
Hollinger	7.77⅛
McIntyre	1.75
Newray	.12⅛
Porcu. Crown	.30
Vipond	.70
West Dome	.13

*Bid prices. † Closing prices. ‡ Last quotations.